RESEARCH REPORT

Eleventh Annual

North Central Weed Control Conference

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This report is prepared in advance of the 11th annual meeting of the North Central Weed Control Conference. It contains abstracts and summaries of research work which has been completed during the past year. It represents the combined effort of a large number of individual contributors as well as the members of the Research Committee. This report is intended to serve as a source of up-to-date information for the research, extension, regulatory and industrial workers interested in the various aspects of weed control.

Neal E. Shafer, Chairman, Research Committee

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Sorghum

Corn = - - - - - - - - - - - - D. W. Staniforth, Department of Botany and Plant Pathology, Iowa State College, Ames, Iowa

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Turf

Vegetables - - - - - - - - - G. F. Warren, Horticulture Department, Purdue University, Lafayette, Indiana

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Control of Brush in Forests, Tree Plantations, and Farm Woodlands -- H. L. Hansen, School of Forestry, University of Minnesota, University Farm, St. Paul, Minnesota

Control of Poisonous Woody Plants, Alternate Hosts, and other Woody Plant Problems - - - - - - - - - - - J. E. Kuntz, Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin

Chemical Drying and Pre-harvest Weed Control -- W. M. Phillips, U.S.D.A. Weed Investigations, Fort Hays Experiment Station, Hays, Kansas

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Mechanical Considerations and Aerial Applications -- R. E. Larson, Agricultural Engineering Building, University of Missouri, Columbia, Missouri

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Quackgrass QUACKGRASS

Summary

K. P. Buchholtz

The results demonstrate the necessity of considering the environment, geographical location and plant conditions at time of treatment when applying control measures to quackgrass. Under specific conditions promising control may be obtained by a number of measures but applications frequently produce mediocre results when conditions are less than favorable.

Use of foliage applications of MH, 2,2-dichloroproprionic acid (dalapon), and 3-amino-1,2,4-triazole (ATA) at rates of from 2 to 8 lb/A in the spring gave from slight control to excellent control of quackgrass in several instances when followed by tillage. Such applications have the advantage of economy and present little or no residual toxicity to crops planted shortly after treatment. The success of foliage applications of these herbicides appears to be influenced by the abundance of the quackgrass foliage, the growth stage of the plant and the interval between treatment and tillage.

Soil treatments with CMU, analogues of CMU, dalapon, TCA and boron containing compounds varied considerably in effectiveness. Soil type, leaching rate and soil temperatures are presumed to account for the variable results. Essentially complete control of quackgrass was obtained by applications of from 20 to 50 lb/A of CMU, 80 to 193 lb/A of TCA, 50 to 100 lb/A of dalapon and approximately 1200 lbs/A of boron containing compounds. In some instances combining TCA and dalapon applications with tillage improved the control obtained. Use of tillage in conjunction with CMU did not appear advantageous.

Application of hexachloroacetone, ATA, MH and IPC as soil treatments or as foliage applications without tillage did not give promising results.

Methyl bromide was effective in controlling quackgrass as were applications of ammate.

Abstracts

Effect of Amizol (3-amino-1,2,4-triazole) on quackgrass (Agropyron repens) with corn following application. Beatty, R. H., Tafuro, A. J., and Guest, R. T. In May, 1954, a series of 4' x 4' plots, replicated 2 times were sprayed for quackgrass control with 2 and 4 lb/A of Amizol (3-amino-1,2,4-triazole). Application was made when quackgrass was 4 to 8 inches tall. Each treated plot and check plots were cultivated at 3 day intervals for a period of 2 weeks after spraying. Cultivation was done by turning over soil to a depth of 6 to 8 inches and leveling to assimulate a plowing and discing. Another test consisting of 1/2 acre plots on a commercial farm in Zionsville, Pennsylvania was sprayed in early spring for quackgrass control on fall plowed land using 4 and 8 lb/A Amizol. Two weeks after application farmer disced, fitted and planted land to field corn (Ohio C-12).

Results: The 4' x 4' plots treated in May, 1954 gave good quackgrass control when cultivation followed application of Amizol. Control of quackgrass was 95 pct. at the 4 pound rate of Amizol followed by cultivation at the 6, 9 and 12 day period after application. The 2 pound rate followed by cultivation at these same time intervals gave 80 to 85 pct. quackgrass control. Plots cultivated 3 days after application gave 40 to 50 pct. control. All plots treated with Amizol at the 2 and 4 lb/A rate, not cultivated, although chlorotic for 4 to 5 weeks, recovered practically 100 pct. In the second test which consisted of 1/2 acre plots on a commercial

farm, both 4 and 8 lb/A, disced 2 weeks after application, gave 95 to 98 pct. control of quackgrass. There was no injury to corn planted 2 weeks after cultivation. Normal cultivation was used by the farmer throughout the season and initial quackgrass control of 95 to 98 pct. held throughout the season to harvest time. Both tests indicate the necessity of tillage after application of Amizol for control of quackgrass. (Contributed by Agr. Res. Div., American Chemical Paint Co., Ambler, Pa.).

The effect of straw mulching, surface black fallowing and tillage following applications of MH to quackgrass. Bibbey, R. O. and Buckley, E. H. An amine preparation of MH was applied at 4 or 8 lb/A to 1/2 sq. rod plots on June 18, 1954. Quackgrass was in the early pre-head stage growing on former potato land that had been fall ploughed. Treatments were: (1) After 4 days three plots treated with 8 lb of MH were mulched with 8-12 inches of straw, (2) After 7 days three check plots and three plots each that had been treated with 4 lb and 8 lb of MH were shallowly hoed and surface black fallow continued throughout the season, (3) After 10 days one half of each of four plots treated with 4 lb and 8 lb of MH were tilled 4-6 inches deep with a Hall rototiller, an auger-type machine that turns over the soil without unduly removing rhizomes.

About 98 pct. of the straw mulched quack showed no growth throughout the season. On October 21 rhizomes on these plots were still fresh but no new ones had been produced in 1954 and only a few weak sprouts were noted. The odd plants that had penetrated the mulch showed active rhizome growth. All hoed plots receiving 4 lb of MH showed partial regrowth inhibition for 3 weeks. One plot continued to show inhibition throughout the season, the other two after 7 weeks showed greater regrowth than the check. On October 21 these showed no new rhizomes, but much re-sprouting and little decay. Hoed plots treated with 8 lb of MH showed 99 pct. inhibition for 3 weeks, and marked inhibition throughout the season. On October 21 they showed no new rhizomes, little sprouting and little decay. The rhizomes were darker than normal. Hoed check plots showed about 70 pct. rotting rhizomes with the remainder dark to healthy and weakly sprouting. Treated untilled quack was shorter than check with some purpling. Effects were more pronounced on plots treated with 8 lb of MH. In October no effects were noted on tops or rhizomes of plants in these plots. Tilled plots treated with 4 lb of MH showed inhibition throughout the season with a recovery on October 21 of 20, 20, 20 and 50 pct. for the 4 plots. Inhibition on tilled plots treated with 8 lbs of MH was more pronounced and variable with a recovery in October of 1, 10, 20 and 50 pct. (Dept. of Botany, Ontario Agricultural College, Guelph, Ontario, Canada)

Quack grass control with herbicides. Brown, D. A. An experiment was laid down in June 1952 for the purpose of comparing CMU with TCA. The former was applied at rates of 20, 40, 60 and 80 lb/A and the latter at 40, 60, 80 and 100 lb/A. All rates were applied with 120 gal. water/A. After a one-year lapse TCA plots had developed a regrowth of from 75% on the 40 lb. rate to 25% on the 100 lb. rate. CMU plots remained free of quackgrass throughout 1954 while TCA plots at all rates were almost completely re-infested.

An additional set of plots was treated in June 1953 using TCA at 100 lb/A., CMU and Dalapon at 40 lb/A., and Urab (2049 PDU) at 20, 40, 60 and 80 lb/A. By October 1954 no regrowth had occurred on the CMU and Dalapon plots, 35% on the TCA plots, 18% on the Urab at the 20 lb. rate; 5% at 40 lb. rate and none at the two higher rates. (Experimental Farm, Brandon, Man.)

Residual effect of CMU, Dalapon and Urab. Brown, D. A. CMU applied to a solid stand of quackgrass June 20, 1951 at 20, 40, 60 and 80 lb/A left all plots completely devoid of vegetation at the end of 1951. Crops seeded May 1952 included wheat, oats, barley, rye, flax, corn, potatoes, alfalfa, brome grass, peas, tomatoes carrots, radish, lettuce, cabbage and onion. All crops produced seedlings but none survived beyond a six-weeks period. The same crops were seeded in 1953. On plots treated at the 20 lb. rate alfalfa maintained a 15% stand, carrots 10% and potatoes 8%. Other crops gradually died. At rates of 40 lb. up the soil remained bare throughout 1953. The same crops were seeded late in May 1954. The 20 lb. rate plots had regained fertility producing nearly normal grain crops. Corn yellowed but made a crop. Alfalfa, sweet clover, potatoes and beans did well. Brome grass made a 50% stand. Carrots and onions were fair to good. Weeds growing normally were wild millet (in profusion), Russian pigweed, perennial sowthistle and tansy mustard. Crops survived from 25 to 75% on plots receiving the 40 lb. rate. The 60 to 80 lb. rate still held the soil almost 100% infertile. Potatoes and alfalfa struggled for two months then succumbed.

Plots treated with CMU and Dalapon 40 lb/A and Urab at 20, 40, 60 and 80 lb/A in June 1953 were seeded to alfalfa and sweet clover in June 1954. Seedlings appeared in profusion but soon succumbed except on the 20 lb. rate of Urab where a thin stand was established. At Brandon rates of CMU in excess of 40 lb/A induce soil sterility lasting three years or longer. (Experimental Farm, Brandon, Man.)

Control of quackgrass by use of maleic hydrazide, 2,2-dichloroproprionic acid and 3-amino-1,2,4-triazole combined with tillage. Buchholtz, K. P. On April 1, 1954 and old sod heavily infested with quackgrass was fertilized with 200 lb/A of ammonium nitrate and 500 lb/A of a 0-10-30 fertilizer. On May 6 plots 13 by 50 feet in size were treated with a sodium salt preparation of maleic hydrazide (MH), with a sodium salt preparation of 2,2-dichloroproprionic acid (DAL) and with 3-amino-1,2,4-triazole (ATA) at the rates of 4 and 8 lb/A. All applications were made in water equivalent to 20 gal/A. At time of treatment the quackgrass had a foliage growth of about 8 inches. The entire area was plowed on May 13. The area was then fitted and W595 corn planted on May 20 with 4 rows of corn on each of the treated plots. Two rows of corn per plot were treated with 6 lb/A of an amine preparation of DNBP and 2 rows with 2 lb/A of CMU to control annual weed growth. No cultivation was given any treated plot throughout the season. One set of untreated plots was hoed once during the season on June 25. An additional set of plots received no treatment and no tillage. On June 8 quackgrass shoots were counted in quadrats on each plot. On July 19 corn plant heights and plant numbers were determined. At maturity the corn was harvested for grain and yields determined. Three replications were used. The soil type on the area was a Miami silt loam.

Treatment	Quackgrass shoots per sq. ft.	Corn plant height inches	Corn yield bus/A
None	21.24	53.2	53.5
1 hoeing	18.63	57.4	67.7
ATA - 4 lbs/A	9.26**	62.6**	82.2**
" 8 "	2.16**	61.7**	87.7**
DAL - 4 lbs/A	1.64**	62.7**	88.2**
" 8 "	.14**	60.4**	88.2**
MH - 4 lbs/A	.47**	65.0**	87.1**
" - 8 "	.17**	64.4**	87.2**

Nearly complete control of the quackgrass resulted from use of MH and DAL at 4 and 8 lb/A and ATA at 8 lb/A. This control continued throughout the season and regrowth was still very scanty on these plots at time of corn harvest. In this trial none of the quackgrass control treatments gave any evidence of injury to the corn as indicated by abnormal growth, reduced plant stand or reduced height of the corn plants. Corn yields were substantially higher on treated plots than on plots that were untreated or those that had been hoed. (Dept. Agronomy, University of Wisconsin, Madison, Wisconsin.)

Comparison of the effects of several preparations of maleic hydrazide upon quackgrass. Buchholtz, K. P. and Zick, W. H. Quackgrass with a top growth of from 4 to 6 inches was treated on April 30, 1952 with 4, 8 and 16 lb/A of three preparations of MH: the sodium salt containing wetting agent (MH-40), the diethanolamine salt containing wetting agent (X-22) and the diethanolamine salt without wetting agent (MH-30). All preparations were applied in water equal to 40 gal/A. On the 13th day following the MH applications the entire area was plowed and worked down with a harrow. The effectiveness of treatments was measured by shoot counts taken on June 11, 1952. The 4 lb rate of all preparations except MH-30 gave significant reductions in shoot counts over check. The 8 lb rate gave significant reductions in shoot counts over the 4 lb rate within each respective preparation, and the 16 lb rate gave significant reductions in shoot counts over the 8 lb rate within each respective preparation. All rates of MH-40 were significantly better in inhibiting shoot growth than respective rates of MH-30, and all rates of X-22 were significantly better than respective rates of MH-40. (Dept. of Agron., Univ. of Wis.,Madison,Wis.)

The effect of CMU and PDU on undisturbed stands of couchgrass, Agropyron repens. Carder, A. C. The investigation involved the application of the chemicals in 2 different years and at 2 different sites. In the first instance, CMU was applied in the spring of 1952 at 4 different rates, in the second PDU (phenyldimethylurea) was applied in the spring of 1953 also at 4 different rates. The latter test included a 40 lb/A application of CMU as a comparison. The 1952 test was on good grade agricultural soil but this was heavier and shallower than that on which the 1953 experiment was platted. The chemicals were applied in water spray at the rate of 80 gal/A. The couch was a foot high and in shot-blade when the treatments were made. Soil moisture was good in 1952 through to 1954. The effects of the various treatments were appraised from time to time, the results of which are shown in the table.

lb/A	Percentage survival after months or years following treatment			
	1952 experiment			
	1952 3 mo.	1953 1 yr.	1953 15 mo.	1954 2 yrs.
CMU at 10	50	15	12	8.5
20	45	5	4	0
40	30	1	0	0
80	18	0	0	0
	1953 experiment			
	1953 2 mo.	1953 4 mo.	1954 1 yr.	1954 15 mo.
PDU at 20	43.8	35.0	27.5	61.2
40	21.2	10.0	7.2	11.0
80	12.5	2.2	2.5	1.2
100	7.5	1.0	1.2	0.5
CMU at 40	21.2	10.0	6.0	10.5

The data of the 1st experiment indicate that the maximum effect of CMU is obtained at least up to 2 years and that rates of over 20 lb/A effected complete kills. In the 2nd experiment the 40 lb. rate of CMU did not totally eradicate couch and revival occurred after 1 yr. The effect of 40 lb. of PDU was about the same as that of an equal quantity of CMU. PDU at 80 lb and 100 lb/A did not effect complete kills but where these rates had been applied the couch was still dying at the end of 15 mo. Where light rates of PDU were used, i.e., 20 lb., strong revival set in after 1 yr. (Contribution of Experimental Station, Beaverlodge, Alberta.)

Treatment of couchgrass with CMU alone and in combination with cultural means. Carder, A. C. A continuous infestation of couch, Agropyron repens, on a shallow black clay loam was treated with CMU at four different rates and at two different times: late spring and early fall. The chemical treatments were combined with four tillage practices. The CMU was applied in a water spray at the rate of 80 gal/A. The effects of the various treatments were appraised from time to time. The procedure and results of the experiment are described in the table.

Treatment	CMU lb/A	Percentage survival after months or years following treatment					
		Late spring treatment				Fall treatment	
		1952 3 mo.	1953 1 yr.	1953 1 1/4 yr.	1954 2 1/4 yr.	1953 1 yr.	1954 2 yr.
CMU on undisturbed sod	10	50	15	12	8.5	12	5
	20	45	5	4	0	4	1.5
	40	30	1	0	0	2	0.5
	80	18	0	0	0	0	0
CMU applied, one-wayed once 5" deep two weeks later	10	52	17.5	40	40	65	32.5
	20	40	10	12	6	18	13.5
	40	32	5	4	0	12	6
	80	18	1	1	0	4	0
One-wayed once 5" deep, CMU applied	10	80	27.5	18	47.5	40	47.5
	20	60	15	18	5	32	15
	40	42	7.5	3	1	15	1
	80	22	2	0	0	12	0
One-wayed once 5" deep, CMU applied, one-wayed again immediately	10	62	15	19	2.5	40	35
	20	38	12.5	8	7.5	28	22.5
	40	28	5	2	0.5	25	13.5
	80	15	1	0	0	16	7.5

The data indicated that severest injury occurred on undisturbed sod and that cultivation did not enhance the effectiveness of CMU. Generally, best kills were obtained by the spring applications. Under the conditions of the experiment complete kills were obtained with as little as 20 lb. of CMU when applied in the late spring on undisturbed sod. (Contribution of Experimental Station, Beaverlodge, Alberta).

Comparisons of amino triazole, CMU, Dalapon, Polybor chlorate-DB, and sodium chlorate on couch grass sod. Corns, William G. Chemicals and rates (bulk) were as follows: amino triazole 2, 4 lb/A: CMU, 50, 100 lb/A; Dalapon 50, 100 lb/A; polybor chlorate DB spray 2, 3 lb 100 sq. ft: sodium chlorate 2, 3 lb 100 sq. ft; in 100 gal. solution per acre. Vigorously growing couch grass 4-6" tall was sprayed on June 11. Results during current year permit statements that both rates of amino triazole killed top growth but allowed dense regrowth by September; CMU was 90 to 100% effective on top growth depending on rate. Surviving plants were in poor condition and rhizomes appeared to be dead. Dalapon 100 lb. kept plots bare from July onward. Limited regrowth was apparent by fall in 50 lb. treatments. Apparently healthy dormant rhizomes were still present in plots treated at both rates. Polybor DB spray checked growth somewhat but was generally ineffective. Sodium chlorate gave 95-100% kill of top growth by August but by September there were a few shoots of regrowth in plots treated with the lower rate. Rhizomes appeared to be unhealthy. (Contributed by Department of Plant Science, University of Alberta).

Effect of maleic hydrazide on couch grass sod cultivated after chemical treatment. Corns, William G. In mid-June couch grass sod was sprayed with 6 lb. MH 40 in 40 gal. water per acre. One week later the sprayed and check areas were turned over with a spade. Subsequent observations indicated a slight, temporary, unimportant reduction in vegetative cover on treated plots. Winter survival will be assessed next spring. (Contributed by Department of Plant Science, University of Alberta).

Response of TCA treated and untreated couch grass sod to coverage with various depths of soil. Corns, William G. Experimental areas of dense couch grass sod were mowed during first week in June. Replicated 200 sq. ft. areas were treated with sodium TCA 150 lb/A or left as controls. Within each area, bottomless wooden boxes 5, 10, 15 inches high and 2 feet square were filled with black top soil and planted to Kentucky bluegrass to test the usefulness of such chemical treatment or filling procedure in preparation of new lawns on city lots. Within 6 weeks the couch grass had emerged through the 15 inch fill and had established rhizomes in boxes on untreated areas but on treated plots the TCA killed about 99% above ground grass surrounding the boxes of fill, prevented appearance of couch grass in soil in any of the boxes and kept the area bare throughout the season. There were, however, still some apparently healthy rhizomes in the sod in October. Owing to unfavorable weather the catch of Kentucky bluegrass was poor so this part of the experiment concerning upward movement of TCA was inconclusive. Additional observation of TCA areas is of course required. (Contributed by the Department of Plant Science, University of Alberta).

Effectiveness of Dalapon and TCA the next year after treatment of clipped couch grass sod or foliage. Corns, William G. Details of method, and results during 1953 appear in the 1953 N.C.W.C.C. research report. Observations in September 1954 showed very extensive regrowth in all plots treated with Dalapon 18 and 35 lb/A or with TCA at 97 lb/A. The high rate of TCA, 193 lb/A gave best results, about 80% control. There was no advantage from the single plowing done 3 weeks after treatment and results support earlier work showing the advantage of cultivation before application of TCA. Apparently, repeated applications of Dalapon would be necessary for satisfactory control of couch grass sod by foliage sprays of this chemical. (Contributed by Department of Plant Science, University of Alberta).

The effect of herbicides on couch grass. Forsberg, D. E. In July of 1953 solid stands of couch grass were top sprayed, at the heading stage, with TCA at 20, 40 and 80 lb/A, CMU at 20 and 40 lb/A, a combination of TCA 10 lb/A and CMU 20 lb/A, TCA at 10 lb/A and CMU at 40 lb/A, and Dalapon at 10, 20 and 40 lb/A. On the plots receiving straight TCA and Dalapon there was no sign of control. However, in all plots of CMU and CMU in combination with TCA a 100% kill was noted. Examination of the root system in these plots showed the roots to be dried up and no new shoots being produced. (Contribution by the Dominion Experimental Station, Scott, Sask., 1954).

The effect of herbicides on couch grass. Forsberg, D. E. In July, 1954 a series of plots 8 x 12 ft. replicated 6 times on a solid stand of couch were top-sprayed at the heading stage, half the replicates being mowed, were treated with CMU at 20 and 40 lb/A., TCA at 50, 75, 80 and 100 lb/A., dalapon at 10, 30 and 50 lb/A., Karmex W, DW, and FW each at 40 and 60 lb/A., IPC at 10 and 15 lb/A., MH at 4 and 6 lb/A., and amino triazole (ACP-L-549) at 1, 2 and 3 lb/A. Precipitation records were above average for the remainder of the season. TCA and dalapon at all rates on the mowed and unmowed plots gave 100% kill of top growth. The 10 and 30 lb. rates of dalapon showed considerable regrowth in late September. The 50 and 75 lb. rates of TCA were cultivated and the 80 and 100 lb. rates received no cultivation. On the plots receiving 50 and 80 lbs. per acre there was 10 to 15% regrowth. The Karmex and CMU plots were almost identical in that they were severely yellowed and the kill was not complete by the end of September. The plots receiving MH, PCI and amino triazole showed no effective kill on the couch grass. However, the MH and amino triazole plots had retarded the regrowth considerably on the mowed plots. The final results of this trial will not be known until 1955. (Contribution by the Dominion Experimental Station, Scott, Sask., 1954).

Effect of herbicides on couch grass. Friesen, H. A., and D. R. Walker. TCA at 20, 40 and 60 lb/A, Karmex and CMU each at 10, 20, 40 and 60 lb/A, DB powder (polyborchlorate and 2,4-D) at 1, 2, 3 and 6 lb/sq.rd. Ammate (plus a spreader) at 2, 4 and 6 lb/sq.rd, hexachloro-acetone at 2, 4 and 8 gal/A, amino triazole at $\frac{1}{2}$, 1, 2, 4, 8 and 12 lb/A, maleic hydrazide (MH-30) at 5, 10, 15 and 20 lb/A, Dalapon at 5, 10, 20 and 40 lb/A and Borascu at 2, 4, 6 and 8 lb/sq.rd. were each applied to undisturbed couch grass sod in June of 1954. Each of the dosages given above refers to active ingredient. Two weeks after application one-half of each plot was plowed, worked down and seeded to barley. Results: Each treatment with the exception of MH-30 and the $\frac{1}{2}$ lb/A rate of amino triazole resulted in excellent top growth killing of the couch grass. In October of 1954 the outstanding treatment was Ammate at either 4 or 6 lb/sq.rd. since regrowth was absent on both the plowed and not plowed portions of these plots, yet the stand of barley showed little or no effect from the chemical. Karmex and CMU at rates of 20 lb/A or higher showed essentially no regrowth but the barley was killed. TCA at 60 lb/A had some 8 percent regrowth of couch grass and again the barley was dead. Regrowth on the not plowed portions of DB at 3 and 6 lb/sq.rd. was slight while it was heavy on the plowed portions. The reverse was true for each of the amino triazole and MH-30 treatments, while the barley appeared to be unaffected. Dalapon at both 20 and 40 lb/A and Borascu at 6 and 8 lb/sq.rd. showed only very slight regrowth and killed all the barley. Hexachloro-acetone at all rates showed a very heavy regrowth. Further observations will be required in 1955. (Contributed by the Experimental Station, Lacombe, Alberta).

A comparison of Dalapon and TCA on quackgrass. Santelmann, P. W. and Willard, C. J. This is the final data of a report with the same title in the 1953 NCWCC Research Report. Dalapon at 5, 10, 20 and 40 pounds per acre and TCA at 20 and 40 pounds per acre, in three replications, were applied to a second-year alfalfa red clover mixture which was heavily infested with quackgrass. A wetting agent, Dreft or Tween 85, was used at 0.1 of 1 percent of the spray. Treatments were begun one week after removal of the first cutting of hay in the spring, or on long grass in the fall. The plots were 10' x 75', divided into three parts (10' x 25' each), each part receiving a different cultural treatment. Section A was sprayed on June 6 or October 3 and not treated further; B was sprayed on June 6 and plowed on June 15 or on November 4 and plowed on November 12; Section C was plowed June 15 and sprayed on June 20 or on November 12 and sprayed November 20. Due to the extremely dry summer and fall in Ohio, the B and C treatments in the spring were inconclusive since most quackgrass was killed on the plowed checks. Better results perhaps could have been expected from the unplowed plots had there been more rainfall. As estimated on April 21 of this spring (1954), there was a high percentage of quackgrass recovery from the 5 and 10 pound rates of Dalapon regardless of the time of treatment, unless cultural treatments were used. There was an estimated 80% stand reduction on the 40 pound spring treated plots, and 70% reduction on the 20 pound fall treated plots, where no tillage was used. TCA at similar rates was approximately 25% less effective than Dalapon. The lower rates of Dalapon and TCA were much more effective if used in conjunction with cultural treatments. It made little difference whether plowing was before or after herbicide treatment. Plowing alone was relatively ineffective in the fall. Dalapon was again more effective than TCA. Dalapon was also slightly more toxic to alfalfa than was TCA. (Contribution of the Ohio Agricultural Experiment Station.)

Effect of Amizol (Amino triazole) on couch grass (Agropyron repens) and brome grass (Bromus inermis). Shebeski, L. H., and Burrows, V. D. To study the effect of Amizol on brome and couch grass an experiment was set up in which mixed stands of the 2 grasses were treated with Amizol at the rate of 5, 10 and 15 lb/A active ingredient in 5 gals. of water. Plots were 13 x 30 ft. in size. All rates of the chemical caused chlorophyll breakdown in the sprayed plants, and eventually all the top growth died. Soon afterwards, however, new growth developed from the roots, and this regrowth did not show any effects of the chemical. It appears that repeated applications would be necessary to control perennial grasses with this chemical. (Contribution from the Division of Plant Science, The University of Manitoba.)

Effect of methyl bromide (with 2% chloropicrin) on couch grass (Agropyron repens). Shebeski, L. H., and Burrows, V. D. Couch grass was treated with methyl bromide (2% chloropicrin) gas as recommended by the manufacturer. A plastic tarpaulin (125 sq. ft.) was laid over the area to be treated and the edges sealed with moist soil. The base of a dispenser was inserted under the tarpaulin and put into a jar. The chemical was then dispensed into the jar and the tarpaulin left for 24 hours. The gas was applied at the rate of 1 and 2 lb/125 sq.ft. One half the plots were cultivated after treatment, the other half left undisturbed. Observations later in the season showed that the couch grass had been completely killed with both rates of methyl bromide in all plots. (Contribution from the Division of Plant Science, the University of Manitoba.)

Effect of CMU (3-p-chlorophenyl - 1 - 1 - dimethylurea) on couch grass Agropyron repens). Shebeski, L. H., and Burrows, V. D. Quackgrass was treated with CMU at the rates of 0, 5, 10, 25, 50 and 100 lb/A active ingredient, on June 3, 1952. Observations in 1954 showed considerable regrowth of quackgrass where the

lower rates of CMU had been used, but the soil was still bare where rates of 50 and 100 lb/A had been applied. It appears that under Manitoba conditions, at least 50 lb/A of CMU is required to control quackgrass. (Contribution from the Division of Plant Science, The University of Manitoba.)

Control of quackgrass with maleic hydrazide in combination with delayed plowing. Zick, W. H. and Buchholtz, K. P. Quackgrass with a top growth of from 6 to 8 inches was sprayed on May 12, 1953, with 0, 2, 4 and 8 lb/A of MH as the sodium salt applied in water equal to 40 gals/A. A strip including all treatments was plowed on the 3rd, 6th, 10th and 17th day following MH applications. On May 29, 1953, immediately following the last plowing treatment, the entire area was prepared for planting, and on June 4 it was planted to sweet corn. The area received a soil treatment on June 8 to control the annual weeds in order to facilitate the taking of quackgrass shoot counts. Two replicates received 2 lb/A of CMU and 2 replicates received 6 lb/A of DNBP. Counts of quackgrass shoots were made on June 16 and July 10, 1953 prior to any cultivation. The results of both counts showed that all rates of MH significantly decreased the number of shoots over check (0 lb/A) at 3 day delay. At 6 and 10 days delay, however, only the 4 and 8 lb rates showed significant reductions over check, and at 17 days delay no reduction over check was shown by any of the rates except by the 8 lb rate in the June 16th shoot count. At the 6 and 10 day delays the 8 lb rate also gave significant reductions in shoot counts over the 4 lb rate. Shoot counts from check plots plowed after 17 days delay were significantly lower than those from check plots plowed after only 3 days delay. It appears that there was an increase in the natural inhibition occurring between the first and the last plowing dates. Within the 2 lb rate of MH there was no significant difference in number of shoots between days delay. This indicates that MH acts in opposition to this natural inhibition shown within check plots. (Dept. of Agron., Univ. of Wis., Madison, Wisconsin.)

JOHNSONGRASS AND BERMUDA GRASS

O. Hale Fletchall

Summary

Four abstracts were submitted on control of Johnsongrass. Only one included cultural control methods. Dalapon was included in every abstract. This illustrates the wide interest in this chemical. Results with TCA and CMU were reported in three abstracts. Other chemicals on which results were reported were MH, borax, a boron-chlorate mixture, amino triazole, and 2,4-D.

Fallowing from late June until frost gave very good Johnsongrass control but mowing the same period did not.

Dalapon was about as effective at 20 to 30 lb./A. (the lowest rates tested) as it was at higher rates. In comparison with 80 to 100 lb./A. of TCA, 20 to 30 lb./A. of Dalapon varied from almost as effective to more effective. Results from TCA were more variable than those from Dalapon.

Dalapon was more injurious than TCA to crops planted the year following treatment. Crops have failed to grow each year since treatment with CMU at 20 or more lb./A. in the spring of 1952.

Abstracts

Chemical control of Johnsongrass. Elder, W. C. Chemicals used were TCA, CMU and Dalapon. Rates of applications were 25, 50 and 100 lbs. each of TCA and Dalapon and 20, 40, 60 and 80 lbs./A. of CMU in 80 gallons of water. Treatments were made at monthly intervals from June to December, 1953. The Johnsongrass was well established on sandy soil. Twelve major field crops were planted in the treated plots during May, 1954. The test was conducted under extremely dry weather conditions and Johnsongrass stands reported here were determined in October, 1954. Kill from TCA varied more than from CMU and Dalapon from month to month. Possibly because of dry weather the November and December treatments allowed Johnsongrass to make considerable growth in April and May, 1954. However, the final counts were similar to summer and fall treatments. 20 lbs. CMU killed more than 50 percent of Johnsongrass but 40 lbs. or more was necessary for complete eradication. Kill from TCA and Dalapon was similar when used at the same rate but the 100 lb./A. rates did not completely eradicate Johnsongrass in any of the treatments. Most of the crops planted in the treated areas in May emerged. All crops died soon after emergence on all CMU plots. Most of the crops survived the TCA treatments, especially those applied in the summer months. Dalapon was more injurious to the planted crops than TCA. The 100 lb./A. of Dalapon killed all crops before the season was over. Climbing milkweed (Ampelamus albidus) was observed growing in the CMU plots where the soil was completely bare of other vegetation. (Contribution of the Agronomy Department, Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma.)

Chemical and cultural control of Johnsongrass. Fletchall, O. Hale. In 1953, Johnsongrass was mowed and borax, boron-chlorate mixture (25% sodium chlorate), sodium TCA and CMU were applied on June 27. MH was applied July 10, and the plots were spaded one week later. Dalapon (sodium salt of a,a-dichloropropionic acid) was applied July 23. Fallowing and bi-weekly

mowing began June 27 and continued until frost. Stems of Johnsongrass were counted July 14, 1954. The pounds per acre of chemicals and percent control, compared to the check which contained 6 stems per sq. ft. were: 1,000 lb. borax, 1%; 1,000 lb. boron-chlorate mixture, 70%; 100 lb. sodium TCA, 66%; 50 lb. CMU, 28%; 20 lb. Dalapon, 91%; 50 lb. Dalapon, 91%; 10 lb. MH and spaded, 87%; bi-weekly mowing, -12% (increase in stand); and fallow, 99%. (Contribution of the Missouri Agricultural Experiment Station and the Field Crops Research Branch, A.R.S., U. S. Department of Agriculture, cooperating.)

Control of Johnsongrass with Dalapon and TCA. Freeman, J. F. 2,2-dichloropropionic acid (Dalapon) sodium salt at 0, 20, 40, and 80 lb./A. and TCA sodium salt 100 lb./A were applied in water 240 gal./A. as foliage sprays on first growth Johnsongrass of one set of plots July 14, 1953 when seeds were in early milk stage and to a second set August 18 when regrowth of plots mowed July 14 had reached a height of 2 to 3 feet. Soil sprays of Dalapon at above rates and TCA at 80 lb./A. were applied July 14 to a third set of plots from which Johnsongrass had been removed as hay and the land plowed and disked just prior to treatment. "Tide" 1 lb./100 gal. water was used as wetting agent. Rains amounting to 3 inches fell between July 17 and August 5 and 1.13 inches between September 5 and October 20. Preliminary observations of top kill and weight of live rhizomes in the soil were made October 20, 1953 and reported in NCWCC Research Report, 1953.

In final observations July 6, 1954 the average number of Johnsongrass stems present on ten-square-foot quadrats at random in each plot were determined as follows: foliage sprays on first growth plants of Dalapon 0, 20, 40, and 80 lb. and TCA 100 lb./A. resulted in 35, 1.6, 0.2, 1.2, and 0.7 plants/sq. ft., respectively. Foliage sprays at like rates of these materials on second growth plants resulted in stands of 22.4, 1.7, 1.5, 1.3, and 0.3 plants/sq. ft., respectively. Soil sprays of Dalapon 0, 20, 40, and 80 lb. and TCA 80 lb./A. resulted in 9.3, 1.5, 1.5, 1.4, and 0 plants/sq. ft., respectively. (Contribution of the Kentucky Agricultural Experiment Station.)

Response of Johnsongrass to various herbicides. Lee, Oliver C. The following chemicals at rates indicated were applied to Johnsongrass (Sorghum halepense) during the month of May, 1954. Growth averaged 15 in. in height. 3-Amino 1,2,4-triazole, 2, 4 and 8 lb./A; MH, 10, 20 and 30 lb./A; Alpha, alpha-dichloropropionic acid, 30, 40 and 50 lb./A; 2,4-D, 10, 20 and 30 lb./A; and CMU, 10, 20 and 30 lb./A. 3-Amino 1,2,4-triazole caused severe chlorotic symptoms of growth present at the time sprays were applied. Some 4 weeks later the Johnsongrass had recovered and grew normally the remainder of the summer. MH caused only temporary stunting of the grass. All rates of Alpha, alpha-dichloropropionic acid destroyed the tops. A slight amount of regrowth appeared on the plots in late August. A part of the root system had been killed. These results are similar to those obtained on a series of plots treated in 1953. 2,4-D treatments destroyed the top growth and retarded the infestation from seedlings only. All CMU treatments destroyed all top growth and has prevented all growth during the summer and fall. Treatments of 20 and more lb./A. of CMU applied in 1952 has prevented Johnsongrass growth as well as crops of corn and soybeans planted in 1952, '53 and '54. (Contribution of the Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Canada thistle (Cirsium arvense)

C. J. Willard

Summary

Five abstracts from as many stations testify to continuing interest in this spiny test. The only basically new thing in them is the rather successful use of 3-amino-1,2,4 triazole on this weed. This amazing chemical may yet be a real help in thistle control. The 2,4-D tests only reemphasized that so far, no "one-shot" treatment with 2,4-D is successful. As in the past, repeated doses have been successful.

Abstracts

Effect of some new herbicides for the control of Canada thistle. Bakke, A. L. and Sylwester, E. P. Square rod plots in southwestern Iowa, of oats, heavily infested with Canada thistle were sprayed on June 28. The oats were beginning to ripen and thistles were in the bud stage. Plots were treated with the butoxy ethanol ester of 2,4-D, the ACP-LV4, ACP-L674, Weedone 638, ACP-L659, Amino triazole, an Atlacide-2,4-D mixture, Dow Brush Killer, and Pitt Brush Killer, all at 1 lb. per acre rates. On July 30 after unseasonably hot weather and no rainfall, there was no regrowth of Canada thistles in any of the plots. On September 21, due to heavy rainfall in August and September there was regrowth in all plots treated with ACP-LV4, ACP-L674, Weedone 638, ACP-L659, Dow Brush Killer and Pitt Brush Killer. Plots treated with amino triazole showed good results. The Atlacide-2,4-D mixture produced 95 percent kill. The regenerated plants 6-8 inches tall were treated again on September 21 and final evaluation is to be made next year. (Contribution of the Iowa Agricultural Experiment Station and Extension Service.)

Heavy applications of 2,4-D to soil for control of Canada thistle. Ham, G. F. and Willard, C. J. Triplicated square rod plots, on Fox silt loam were treated on February 22 with alkanol amine salts of 2,4-D (Dow Formula 40); and the polypropylene glycol butyl ether ester of 2,4-D (Esteron 10-10) at 10, 20, 30, and 40 lb/A. On May 15 there was little thistle top growth in plots treated at the higher rates. However, when rated again on July 10 there was only fair control. Thistles had resprouted vigorously at all rates. On May 15 wheat, corn and soybeans were sown on selected plots following application of the amine salt. No evidence of 2,4-D injury to soybeans, corn or wheat was noted. (Contribution of the Ohio Agricultural Experiment Station.)

Response of Canada thistle to 3-Amino-1,2,4-triazole. Lee, Oliver C. Replicated plots infested with Canada thistle (Cirsium arvense) were sprayed with Aminotriazole on May 13, 1954. At that time plants ranged from 3 to 15 in. in height. Rates used were 2, 4, and 8 lb/A of active ingredient in 150 gal/A of water. Severe chlorotic symptoms resulted from all treatments, which eventually destroyed top growth with the exception of a few plants on plots receiving the 2 lb. rate. Most new shoots arising from roots throughout the entire summer were chlorotic and did not survive. The stand of thistles on all treated plots on Oct. 8 was less than a fraction of 1% of that on check areas. The heavier applications, 4 and 8 lbs. were slightly more effective than the 2 lb. rate. Excavations made on Oct. 8 indicated that portions of the roots had been destroyed to a depth of 12 or more inches. Sections of live roots with live growth buds were found in all treated plots, but they did not appear as healthy as those found in check areas. Some sections were destroyed; others were discolored, indicating that they may not

survive. A portion of each of the treated and check plots were clipped seven days following the application of Aminotriazole with the thought that it would hasten resprouting. Clipping at that time reduced the effectiveness of the treatments. (Contribution of the Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Control of Canada thistle with Amizol. Pavlychenko, T. K. and Bestrop, A. J. A large infestation of Canada thistle (Cirsium arvense) was divided into three separate sections; the first treated with 3,amino 1,2,4-triazole (Amizol at 1½, 3 and 9 lb/A) at pre-bud stage, the second treated with the same rates at bloom stage and the third mowed at bloom stage. In each section the rate plots were divided into four segments: (1) treated (or mowed) once, (2) treated (or mowed) followed by a retreatment when regrowth was in advanced rosette stage, (3) treated (or mowed), followed by a thorough cultivation with a one-way disk when the regrowth was in bloom stage and (4) treated (or mowed), cultivated when regrowth was in bloom stage, followed by a retreatment when the second stand of regrowth was in the advanced rosette stage. The weed was growing on sandy loam soil and moisture was abundant. RESULTS: Preliminary observations indicated the following general trends: topkill of the original growth was slow but complete in all treated plots; regrowth was quite low, being especially scarce with the 3 and 9 lb/A rates of the chemical in the plots which received additional cultivated and/or retreatment; the regrowth that occurred in the section treated once at pre-bud stage was apparently normal, but as many as 90 to 100 percent of the regrowth shoots that followed retreatments made in the section treated at bloom stage were very strongly etiolated. At this time it is impossible to form an opinion on the final effects of this new chemical. Further observations on regrowth will be made in 1955. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

The effectiveness of various herbicides applied post-emergence to Canada thistle. Wood, H. E. and Howden, J. S. Ten-foot square plots of a heavy infestation of Canada thistle, (Cirsium arvense) in a field of flax south of Winnipeg were knapsack sprayed in the rosette and pre-bud stages, June 15 and July 2 respectively. One rosette-treated plot in each series of herbicide was re-treated at the time of applying the pre-bud application to determine the advantage, if any, of two treatments. Results are summarized as follows: 2,4-D butyl ester gave very little control at 2 oz./A, fair control when re-treated (4 oz. in all), very little control at the pre-bud with 4 oz./A but very considerable control at 8 oz. 2,4-D amine was ineffective in the rosette at 3 oz./A even when re-treated, whereas 6 oz. pre-bud gave considerable measure of control. MCP ester and amine applied comparably to 2,4-D gave rather better results, particularly the amine - the plot receiving 3 oz./A applied in the rosette stage and re-treated was rated the best control, the 6 oz. pre-bud the second best. Flax proved more tolerant to MCP amine than other herbicides. Amino-triazole was ineffective at 2 oz./A but gave some control on the re-treated plot as, also 4 oz. pre-bud and somewhat more control at 8 oz. however all flax was destroyed even at the 2 oz. rate. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Field Bindweed

Lyle A. Derscheid

Summary

The application of several forms of MCP, 2,4-D and 2,4,5-T to field bindweed during a year when rainfall was 75% of normal indicated that 2,4-D formulations were superior to similar formulations of MCP or 2,4,5-T when applied at 0.5 and 1 lb./A. rates in the fall and retreated the following spring. The 0.5 lb./A. rate of ethanol and isopropanal amines the 0.5 and 1.0 lb./A. rates of a propylene glycol butyl ether ester and tetrahydrofurfyl ester and 1 lb./A. rate of a butoxyethanol ester and a wax emulsion of 2,4-D reduced the stand significantly. The 0.5 lb./A. rate of the tetrahydrofurfyl gave 68% elimination and it was the best. Similar forms of MCP and 2,4,5-T and an emulsified acid of 2,4-D did not significantly reduce stands. In another experiment under dry conditions 1 lb./A. of a 2,4-D ester gave 91% control and 0.5 lb./A. of the ester was equal to 1 lb./A. of a 2,4-D amine.

A high rate of 80 lb./A. of 2,4-D did not give satisfactory control of field bindweed under Kansas conditions. However, the same rate of an ester, an amine and an acid form of 2,4-D and an ester and an amine form of 2,4,5-T averaged 95% elimination in Texas when applied to a clay loam in December, while 40 lb./A. rates averaged 79% control. Under irrigation 80 lb./A. rates of the same 5 chemicals as well as SES & Natrin applied during the spring of 1954 appeared to give 95 to 100% elimination by fall.

Also under irrigation spring applications of a mixture of 40 lb./A. of each of SES plus 2,4-D amine, a mixture 160 lb./A. of sodium chlorate plus 40 lb./A. each of 2,4-D amine and amizol, a granular mixture of boron and 2,4-D at 640 lb./A. and 240 lb./A. of a mixture of ammonium silicofluoride and 2,4-D ammonium salt each appeared to give 98 to 100% elimination by fall, while a mixture of 10 lb./A. of Karmex and 40 lb./A. of 2,4-D amine gave 93%. Two boron 2,4-D mixtures gave good top kill in Kansas, but regrowth occurred.

Sodium chlorate at a 6 lb./sq. rd. rate gave good control of bindweed when applied during 1952 in Kansas, during the fall of 1953 in Kansas and in September in Texas. However, a summer application in 1953 was inferior to 60 lb./A. of CMU 80 lb./A. of phenyldimethyl urea or 16 lb./sq. rd. of concentrated Borascu in Kansas. 5 lb./sq. rd. gave mediocre control on irrigation in Texas.

Concentrated Borascu at 16 lb./sq. rd. was effective in Kansas, when applied during summer or fall, of 1953, while 18 lb./sq. rd. were effective when applied in Texas during September. Spring applications of 16 lb./sq. rd. gave fair results in 1954. Likewise, September applications Polybor-chlorate at 10 lb./sq. rd. was effective in Texas in 1953, but 5 lb./sq. rd. was not sufficient in 1954.

CMU at 80 lb./A. gave fair results in Kansas in 1952, but summer and fall applications were good in 1953. Applications of 40 and 80 lb./A. of Karmex gave good control in Texas in 1953, while fair control was obtained from 60 lb./A. of Karmex W, Karmex DW, and Karmex FW in 1954.

Abstracts

Bindweed control with several soil sterilizing chemicals. Phillips, W. M. Sodium chlorate, CMU, phenyldimethyl urea, several boron compounds, and 2,4-D boron

complexes were applied to field bindweed in 1952, 1953, and 1954. None of the treatments were entirely satisfactory at all times of application. Of the chemicals applied in 1952, sodium chlorate at 960 lbs./A. gave the greatest reduction in bindweed stand. CMU at 40 and 80 lbs./A. was moderately effective but not so satisfactory as the sodium chlorate applications. In 1953 CMU at 60 and 80 lbs., phenyldimethyl urea at 80 lbs., and concentrated borascu at 2,560 lbs./A. were the most effective chemicals tested. Complexes of 2,4-D and boron were applied at 640 and 960 lbs./A. These materials gave a quick top-kill of the bindweed and excellent season-long control. However, there was considerable re-growth on these plots in 1954. Applications made in the fall of 1953 were in general highly satisfactory. One week after treatment a heavy snow was received and the plot area received more than 1 inch of moisture. Early in the 1954 growing season the plots treated in the fall of 1953 showed excellent bindweed control from nearly all of the treatments. In the fall of 1954 the CMU and phenyldimethyl urea plots still were virtually free of bindweed. Sodium chlorate at 960 lbs./A. also gave excellent results. The 2,4-D-boron complexes resulted in a quick top-kill and control through part of the 1954 season. By September, 1954 many of these plots were partially re-infested. Eighty lbs./A. of 2,4-D failed to give satisfactory control of bindweed, although there was considerable reduction in the number of plants present. Applications of chemicals in 1954 resulted in good top-kills of bindweed but the experiment has not progressed far enough to make final determinations as to the effectiveness of the various treatments. (Contribution from Field Crops Research Branch ARS, USDA and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.)

Herbicidal screening study for field bindweed (Convolvulus arvensis) control. Wiese, A. F., and Rea, H. E. Square rod plots were treated with several formulations of MCP, 2,4,5-T and 2,4-D respectively in May 1952, and retreated in September 1953. Each herbicide was applied at 0.5 and 1.0 pounds per acre. MCP was applied as the propylene glycol butyl ether ester, butoxy ethanol ester and as the amine formulation (ethanol and isopropyl series). 2,4,5-T was used as a butoxy ethanol ester, tetrahydrofurfyl ester and was a wax emulsion. The 2,4-D formulations applied were amine (ethanol and isopropyl series), isopropyl ester, propylene glycol butyl ether ester, butoxy ethanol ester, tetrahydrofurfyl ester, emulsified acid, 2,4-Dichlorophenoxy ethanol and a wax emulsion. In general, the 2,4-D materials were superior to the MCP and 2,4,5-T formulations. None of the MCP or 2,4,5-T treatments caused a statistically significant reduction in the stand by May 1954. The 2,4-D treatments which significantly reduced the bindweed stand were the 0.5 and 1.0 pound rates of propylene glycol butyl ether ester and the tetrahydrofurfyl ester, the 1.0 pound rate of butoxyethanol ester and the wax emulsion and the 0.5 pound rate of amine (ethanol and isopropyl series). The 0.5 pound rate of tetrahydrofurfyl ester of 2,4-D gave the best control, and reduced stands 68 percent. The total rainfall for 1952 and 1953 was 29.36 inches which was 10.48 inches less than average. (Contribution from the Amarillo Experiment Station, U.S.D.A. and Texas Agricultural Experiment Station Cooperating. Approved as T.A.E.S. T.A. 2054).

Control of field bindweed (Convolvulus arvensis) with heavy rates of translocated herbicides. Wiese, A. F., and Rea, H. E. On December 16, 1953 2,4-D amine, 2,4-D ester, 2,4-D acid, 2,4,5-T amine and 2,4,5-T ester were applied at 10, 20 and 40 pounds per acre to square rod plots on Pullman clay loam soil. The 2,4-D amine was also applied at 80, 120 and 160 pounds per acre, and SES was applied at 10 pounds per acre. For comparison of the above herbicides with conventional soil sterilants Polybor Chlorate was applied at 1600 pounds per acre. The treatments along with a control were replicated three times. By September 1954, none of the

translocated herbicides were noted to be superior, and equivalent amounts of each gave approximately the same amount of bindweed control. The 10 pounds rates of the translocated herbicides and the Polybor Chlorate did not reduce the bindweed enough to be statistically significant, but 20 pounds per acre or more did. The average control with all chemicals at the 20 and 40 pound rates was 69 and 79 percent respectively. The 80, 120 and 160 pounds per acre applications of 2,4-D amine reduced the stand of bindweed 95, 97 and 92 percent respectively, indicating that 80 pounds per acre was the optimum rate of application in this experiment. The Polybor Chlorat and the translocated herbicides applied at 40 or more pounds per acre controlled the winter annual grasses mainly Rescue grass (Bromus catharticus). Contribution from the Amarillo Experiment Station, U.S.D.A. and the Texas Agricultural Experiment Station Cooperating. Approved as T.A.E.S. T.A. 2050).

Control of field bindweed with 2,4-D under semi-arid conditions. Wiese, A. F., and Rea, H. E. During the summer of 1953, 0.5 and 1.0 pound of 2,4-D ester and amine per acre were applied to bindweed at several different times. No applications were attempted until August when enough rain fell to start the weeds growing vigorously. Treatments were made on August 3, August 21, September 4 and October 1. The bindweeds were growing rapidly at the time of the first and second treatments and the runners were 3 to 5 and 6 to 10 inches long respectively. The weeds did not grow appreciably between the second and third application and by the time of the fourth application about 50 percent of the bindweed tops had dried up. With the exception of the first treatment on which some re-growth appeared in about 2 weeks, the chemical treatments kept the plots practically free of bindweed until winter. In the spring of 1954 the average percent control for the first, second, third and fourth times of treatment was 44, 84, 34 and zero respectively. In November 1953, the average depth of root kill for each of the four times of treatment was 3.7, 9.8, 1.4 and zero inches respectively. At each time of treatment the ester formulation caused greater root kill and more weed control than did the amine. The highes control, 91 percent, was obtained with 1.0 pound of ester on August 21. (Contribution from the Amarillo Experiment Station, U.S.D.A. and the Texas Agricultural Experiment Station Cooperating. Approved as T.A.E.S. T.A. 2051).

Control of Field Bindweed Under Irrigated Conditions on Pullman Clay Loam. Wiese, A. F. and Rea, H. E. Bindweed stands were reduced 100, 100, 95, 87 and 87 percent under irrigated conditions by the fall of 1954 following August, 1953 applications of 0.5 pounds per square rod of Karmex W, 0.25 pounds of Karmex W, 6 pounds of sodium chlorate, 18 pounds of Concentrated Borascu, and 10 pounds of Polybor Chlorate, respectively. Polybor applied at 10 pounds per acre had no effect on the stand of bindweed. A 2-inch irrigation was used immediately following the applications. Three additional fall and two summer irrigations of 2 inches each were used. Rains in October, April and May were heavy. Sorghum was sown on half of each plot following early sweep cultivation in 1954. Sweep cultivation did not influence the effects of the herbicides on bindweed. Enough Karmex W washed from the treated areas to control annual weeds 50 feet away. Sodium chlorate, Polybor chlorate, Concentrated Borascu, Polybor and Karmex W had penetrated the soil to a depth of 24, 18, 6 6 and 6 inches, respectively, by November 1, 1953. Karmex W at .25 pounds per square rod reduced sorghum forage yields 66 percent. The other herbicides caused greater yield reductions.

Various herbicides and mixtures applied to duplicate plots were used in a previously untreated area during the spring of 1954. A 10-inch flooding was given the experimental area shortly after applying the herbicides and within two weeks

8.5 inches of rain fell. Bindweed control by fall from some of the more effective treatments was: 100 percent from 2,4-D acid, 2,4-D amine, 2,4,5-TP ester, 2,4,5-TP amine, SES and Natrin, each applied at 80 pounds per acre; 100 percent from mixtures of 40 pounds of SES and 40 pounds of 2,4-D amine, 160 pounds of sodium chlorate and 40 pounds of 2,4-D amine and 40 pounds of Amizol and 40 pounds of 2,4-D amine; 99 percent from 640 pounds of DB Granular; 98 percent from 2400 pounds of Herbicide S-2500 (ammonium silicofluoride 95.24% and ammonium 2,4-dichlorophenoxyacetate 2.38%), 95 percent from 80 pounds of 2,4-D ester, 93 percent from a mixture of 10 pounds of Karmex W and 40 pounds of 2,4-D amine and 82 percent from 80 pounds of SESIN. Mediocre control was obtained from 20 and 60 pounds per acre each of Karmex W, Karmex FW and Karmex DW; 2560 pounds of Concentrated Borascu, 1600 pounds of Polybor Chlorate, and 800 pounds of sodium chlorate respectively. (Contribution from the Amarillo Experiment Station, U.S.D.A. and the Texas Agricultural Experiment Station Cooperating. Approved as T.A.E.S. T.A. 2055).

Field Bindweed control with soil sterilants. Wiese, A. F., and Rea, H. E. On September 22, 1953, Concentrated Borascu, Polybor Chlorate and sodium chlorate were applied at 18, 10 and 6 pounds per square rod respectively, and Karmex W was applied at 0.5 and 0.25 of a pound per square rod. After the chemicals were applied, some of them were left on the soil surface while others were disked into the soil or leached into the soil surface with 20 gallons of water per square rod in an effort to prevent the sterilants from blowing away. Each treatment was replicated 3 times. During October 1953, 4.59 inches of rain fell on the area and as a result, all of the chemicals were leached well into the soil. Studies conducted in December 1953, to determine the depth of chemical penetration into the soil showed that the sodium chlorate and Polybor Chlorate were leached to a 12 inch depth, but the other herbicides were not found below 6 inches deep. The average bindweed control from all treatments was excellent. A few plants remained on some of the plots. (Contributic from the Amarillo Experiment Station, U.S.D.A. and Texas Agricultural Experiment Station Cooperating. Approved as T.A.E.S. T.A. 2053).

Control of Weeds in fence rows. Wiese, A. F., and Rea, H. E. Soil sterilants were applied in April, May and August, 1952, to fence rows infested with field bindweed (Convolvulus arvensis), Johnson grass (Sorghum halepense), Rescue grass (Bromus Catharticus), witch grass (Panicum Capillare), fireweed (Kochia scoparia), and puncture vine (Tribulus terrestris). The residual effects of the 1952 treatments were similar for all dates of treatment by September, 1954. Excellent control of all species was obtained from the residual effects of 8 ounces of Karmex W and a mixture of 10.8 pounds of Polybor and 10.8 ounces of TCA per square rod. Most species were controlled by the residual effects of 6 ounces of Karmex W, 18 pounds of Concentrated Borascu and 7 pounds of sodium chlorate per square rod. The residual effects on most species were not pronounced on the plots treated in 1952 with 5 pounds of sodium chlorate, 40 pounds of calcium borate, 4 ounces of Karmex W, 16 and 14 pounds of Concentrated Borascu, 7 pounds of Atlacide, 10 pounds of Polybor Chlorate and a mixture of 5.4 pounds of Polybor and 5.4 ounces of TCA per square rod. Johnson grass was the only species controlled by the residual effects of 10 pounds of herbicide S-2500 (ammonium silicofluoride 95.24% and ammonium 2,4-dichlorophenoxyacetate 2.38%), 8 pounds of Polybor Chlorate, 3 pounds of sodium chlorate, and 10 or 15 ounces of TCA per square rod. There was no residual effect on any of the species from the use in 1952 of 25 pounds of calcium borate, 5 pounds of herbicide S-2500, 3 pounds of sodium chlorate, 6 pounds of Polybor Chlorate and 5 ounces of TCA per square rod. (Contribution from the Amarillo Experiment Station, U.S.D.A. and Texas Agricultural Experiment Station. Approved as T.A.E.S. T.A. 2052).

Leafy Spurge

Summary

Lyle A. Derscheid

The abstracts submitted this year indicate that leafy spurge control programs need to be based on the use of soil sterilants and cultural practices with normal rates of 2,4-D serving as supplements to speed up some of these practices. However, heavy rates of 2,4-D look very promising on this weed.

Several soil sterilants are particularly effective for eliminating small patches. Borascu was effective at 15 to 20 lb./sq. rd. in South Dakota when applied in July or September. 25 lb./sq. rd., the lowest rate used, gave 96% elimination in 12 weeks in Iowa. Concentrated Borascu gave almost complete elimination at 8 lb./sq. rd. in Saskatchewan, while in South Dakota 7½ lb./sq. rd. rate gave 90% elimination and 10 lb./sq. rd. gave 95 to 97% elimination. 15 lb./sq. rd., the lowest rate used, of Polybor gave 95% elimination in Iowa while 10 lb./sq. rd. gave similar results in South Dakota and 6 lb./sq. rd. was not effective in Manitoba. Polybor-Chlorate at 5½ lb./sq. rd. gave 95 to 99% elimination with spring and fall application in Saskatchewan, whereas, summer applications of 10 lb./sq. rd. only gave 70% control in South Dakota and 6 lb./sq. rd. was not effective in Manitoba. Fall applications of 5, 7½, and 10 lb./sq. rd. gave 90, 94 and 99% elimination in South Dakota. A summer application of 5 lb./sq. rd. of Chlorax gave 98% control in Iowa, whereas, 5, 7½, and 10 lb./sq. rd. only gave 65, 77 and 75% elimination in South Dakota. However, fall applications of 5, 7½, and 10 lb./sq. rd. gave 90, 90 and 98% elimination in South Dakota. 7½ lb./A. was ineffective in Manitoba.

The boron-2,4-D mixtures applied in the summer of 1954 appeared to have given 100% elimination in Saskatchewan and South Dakota at 2 3/4 lb./sq. rd. The spray and granular materials appeared about equal except that the spray was faster acting. However, regrowth may occur next year.

Sodium chlorate at 3 and 5 lb./sq. rd. rates gave 45 and 40% elimination when applied in July in South Dakota and 6 lb./sq. rd. of Atlacide applied in June and August gave 65 to 75% control in Manitoba. However, 5 lb./sq. rd. applied in July killed 96% of the spurge in Iowa.

Amate at 3 lb./sq. rd. appeared to give 95% elimination after being applied in the summer of 1954 in Iowa. A fall application of 6 lb./sq. rd. killed 90% of the plants in South Dakota, while a summer application only eradicated 70%.

CMU (Karmex W) at 50 and 100 lb./A killed 85 to 90% of the weeds in Manitoba, while 40 lb./A. gave 5% kill in Iowa and 55% in South Dakota. However, the Iowa treatments had been on only 12 weeks. Karmex FW and DW at 50 lb./A. gave 95 and 50% elimination in Manitoba after being on 2 or 3 months.

2,4-D at 1, 2, and 4 lb./A. rates did not reduce stands materially unless used in conjunction with cultural practices. Six lb./A. gave 75% elimination in Manitoba, 10 lb./A. were ineffective in South Dakota and 36 lb./A. killed 90% of the weeds in Manitoba.

Amizol at 10 lb./A. caused chlorosis and gave 15% kill in 12 weeks in Iowa, and regrowth occurred in Saskatchewan after using rates up to 16 lb./A.

Abstracts

Effect of borax compounds and mixtures with 2,4-D on leafy spurge (Euphorbia esula L.). Coupland, R. T. A dense stand of leafy spurge (about 1000 stems per 100 sq. ft.) was treated near Saskatoon on May 21, 1954 with the following herbicides: Polybor Chlorate (73 per cent borates, 25 per cent sodium chlorate) at 2, 3 and 4 lb. per 100 sq. ft.; Concentrated Borascu (61.5 per cent B_2O_3) at 5, 6 and 7 lb. per 100 sq. ft.; a complex of sodium borate (B_2O_3-40.9%) and 2,4-D (acid equivalent -7%) applied dry at 1, 2 and 3 lb. per 100 sq. ft.; and a similar complex (59.5% B_2O_3 and 7% 2,4-D) applied in water at 1, 2 and 3 lb. per 100 sq. ft. By Sept. 21, 1954 (14.89 in. of precipitation having fallen at Saskatoon in the four-month period) no leafy spurge could be found in any plots except for a very few shoots (99% control) in the Polybor Chlorate treatment at 2 lb. per 100 sq. ft. All of these treatments permitted the survival of brome and crested wheat grass. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon.)

Effect of borax compounds on leafy spurge (Euphorbia esula L.). Coupland, R. T. A dense stand of leafy spurge (about 1000 stems per 100 sq. ft.) was treated near Saskatoon on Sept. 18, 1953 in triplicated 100 sq. ft. plots with Polybor Chlorate (73 per cent borates, 25 per cent sodium chlorate) at 2, 3 and 4 lb. and Concentrated Borascu (61.5 per cent B_2O_3) at 3, 4, 5 and 6 lbs. By May 21 the percentage of the treated area free of shoots of the weed was as follows: Polybor chlorate at 4 lb. - 100%, at 3 lb. - 99%, and at 2 lb. - 95%; Concentrated Borascu at 6 lb. - 85%, 5 lb. - 79%, at 4 lb. - 70% and at 3 lb. - 52%. One year after treatment (Sept. 21, 1954) no leafy spurge could be found in the plots treated with Concentrated Borascu at 4, 5 and 6 lb., while the degree of control afforded by Polybor Chlorate at 2, 3 and 4 lb. and by Concentrated Borascu at 3 lb. was rated as 98 to 99 per cent. The precipitation at Saskatoon between the date of treatment and the first observation was 5.38 in. and the total precipitation for the year was 20.27 in. All of these treatments permitted the survival of brome and crested wheat grass. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

The effectiveness of various chemicals compared in the control of leafy spurge. Craig, H. A., Wood, H. E., Watson, W. D., Birt, F. C. Moderately heavy infestations of leafy spurge, (Euphorbia esula) in native grass on light loam soil at two locations on sq. rod plots, were knapsack sprayed with various chemicals at different rates. First set of plots sprayed June 2nd, a second August 31st. Readings were taken in late fall averaging as follows: DB Granular and DB Powder (a boron 2,4-D compound) at 8 lbs./sq. rod, eliminated the spurge 100% and left the grass uninjured. Karmex W (CMU) at both 100 lbs. and 50 lbs./A controlled spurge 85-90%, killing all grass; Karmex FW at 50 lbs./A gave 95% control, likewise killing all grass; Karmex DW at 50 lbs./A gave control approaching 50% with little or no kill of grass; 2,4-D at 32 lbs./A, 85% control; emulsifiable acid of 2,4-D (ACP-638) at 6 and 36 lbs./A gave 75 and 90% control respectively, with noticeable stimulation to the grass. Polybor, polyborchlorate and Atlacide at 6 lbs./sq. rod gave approximately 65-75% control; chlorax liquid 1½ gals./A, chlorax powder 7½ lbs./A and amino triazole at 10 lbs./A gave less satisfactory control. Final readings will be taken in 1955. (Contribution from Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada).

The effect of mixtures of chemicals with and without cultivation, on leafy spurge. Derscheid, Lyle A. Duplicate 1 rd. x 3 rd. plots were plowed in August 1952; 2,4-D treatments began in Sept. and continued the next year. The percentage of control obtained was determined in May 1954. The treatments and percentage of control are given in the following table.

1952 treatment	1953 treatment	Percentage elimination
1# ester	1# ester May, cult. 4 times at emergence	99
10# ester	" " " " " " " "	99
10# ester & 10# amate	" " " " " " " "	99
2# ester	" " " " " " " "	99
4# ester	" " " " " " " "	99
cult. twice	" " " " " " " "	
1# ester	Cult. 4 times at emergence	99
1# ester	Cult. 4 times; 1# ester Sept.	99
1# ester	1# ester Cult. 3 times; 1# ester Sept.	99
------	1/4# ester at 2-wk intervals 5/15-9/15	95
1# ester	1# ester-bracts yellow	60
2# ester	2# ester-bracts yellow	75
4# ester	4# ester-bracts yellow	72
10# ester	10# ester " "	80
10# ester	1# ester " "	78
10# ester	10# ester - May 16	82
10# ester	10# ester - Sept. 8	71
-------	10# ester-bracts yellow	65
-------	10# ester-Sept. 8	55
1# ester 10# amate	Repeat - bracts yellow	60
2# ester 10# amate	Repeat - " "	65
1# ester 10# TCA	Repeat - " "	90
2# ester 10# TCA	Repeat - " "	92
1# ester 5# endothal	Repeat - " "	89
2# ester 5# endothal	Repeat - " "	94
2# ester 10# CMU	2# ester - " "	85
1# ester 10# amate	1# ester May; Cult. 3 times at emergence	95

A high degree of elimination was obtained when 3 or 4 cultivations were performed along with the chemical treatment - the amount of chemical or time of application was of little importance.

Chemical treatments; (1) 1/4# ester at 2-week intervals, (2) a mixture of 2,4-D and TCA applied in fall and retreated in the summer and (3) a mixture of 2,4-D and endothal applied during the fall and retreated the following summer, gave better control than is ordinarily obtained in one year with chemicals (excepting soil sterilants). (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, College Station, South Dakota).

The effect of several soil sterilants on leafy spurge. Derscheid, Lyle A. Duplicate 9' x 15' plots (1/2 sq. rd.) were treated with Borascu at 10, 15 and 25 lb./sq. rd., concentrated borascu, Polybor-chlorate, and chlorax at 5, 7½ and 10 lb./sq. rd., sodium chlorate at 3 and 5 lb./sq. rd., ammonium sulfamate at 2,4 and 6 lb./sq. rd. and CMU at 1, 2, 3, and 4 oz./sq. rd. One series of plots was treated in Sept. 1952 and another series in July 1953. Borascu and concentrated borascu were applied dry, but all others as sprays. The percentage of elimination was determined in May 1954. The mean percentages are given in the following table:

Chemical	Rate lb./sq. rd.	Average Percentage Elimination	
		Sept. 1952 Treatment	July 1953 Treatment
Borascu	10	70	70
"	15	80	87
"	20	95	97
Conc. Borascu	5	45	72
" "	7½	90	92
" "	10	95	97
Polybor-chlorate	5	90	40
" "	7½	94	45
" "	10	99	70
Chlorax	5	90	65
"	7½	90	77
"	10	98	75
Chlorate	3	95	45
"	5	97	40
Amate	2	67	37
"	4	70	60
"	6	90	70
CMU	1/16	0	30
"	1/8	12	5
"	3/16	30	35
"	1/4	55	18

Assuming that the July 1953 treatments had been allowed enough time to produce maximum effects, these data indicate that the borax compounds were equally effective at both dates, but that those containing chlorate or amate were more effective when applied in the fall. The minimum rates required to give satisfactory elimination appear to be 20 lb/sq. rd. of Borascu, 10 lb./sq. rd. of Polybor, Polybor-chlorate and chlorax, 3 to 5 lb./sq. rd. of chlorate and 5-6 lb./sq. rd. of amate, CMU was not satisfactory at these rates. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, College Station, S. Dak.)

The effect of 2,4-D ester, perennial forage crops and cultivation for the control of leafy spurge. Derscheid, Lyle A. Forty-four treatments were applied to duplicate 1 rd. x 5 rd. plots. The experiment was laid out in August 1950. Thirty-two of the treatments included the seeding of bromegrass at that time - 8 of these treatments included the application of 2,4-D in 1951, 8 were treated in 1952, 8 were treated in 1951 and 1952, and 8 were treated in 1951 and 1953. In each set of 8, 2,4-D was applied at rates of 1/2 and 1 lb./A in (1) Spring, (2) Summer, (3) Fall and (4) Spring and Fall. Consequently, some plots received 1 treatment, some 2 and others 4 treatments. Three of the remaining 12 treatments consisted of alfalfa, an alfalfa-brome mixture and bromegrass seeded in 1950, but not sprayed with 2,4-D.

The remaining 9 treatments consisted of intensive cultivation at 2-week intervals from May 15 to August 15, 1951. They were then seeded to bromegrass. One plot was not sprayed, but the remaining 8 were sprayed in 1952 at rates of 1/2 and 1 lb./A in spring, summer, fall and both spring and fall. One-half of each plot was fertilized with 120 lbs./A of ammonium nitrate in 1953. Final counts of leafy spurge were made in May, 1954.

Plots that were cultivated one year, seeded to bromegrass that fall and sprayed with 2,4-D the next year had 95% to 99% elimination of spurge - the amount of 2,4-D and date of application did not appear to be important. A crop of hay of over 1.5T./A was obtained on all plots the year after seeding. Only 60% to 80% elimination was obtained from treatments that did not include cultivation, with the alfalfa being poorest and plots sprayed twice a year the first two years after seeding being the best of the group. Also a crop of hay was not obtained until the second year after seeding. The yield was 2.0 to 2.5T./A. The fertilizer increased the yield of hay, but had no effect on weed control.

An identical experiment started in 1951 will be finished in the spring of 1955. The results so far are very similar. These data indicate that cultural practices are essential for the elimination of large spurge infestations, while 2,4-D is a supplement which will speed up the elimination. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, College Station, South Dakota).

The use of annual crops with cultivation and 2,4-D for controlling leafy spurge. Derscheid, Lyle A. Thirty-three treatments were applied to duplicate 1 rd. x 5 rd. plots. The experiment was started the fall of 1950. One treatment was intensive cultivation at 2-week intervals for 2 years followed by a crop of sudan and another was the same except cultivations were at 3-week intervals. One pair of plots (1 plot in each replication) raised one crop of rye and two crops of buckwheat, another pair substituted sudan grass for the buckwheat. A fifth treatment was the old rye-fallow system for 2 years followed by one year of intensive cultivation. The remaining 28 pairs of plots were seeded to rye in the fall of 1950. Eight pairs had 2 years of rye and 1 year of buckwheat, 8 had 2 years of rye and 1 of sudan grass, 8 had 2 years of rye and 1 of oats. Four of each set of eight were sprayed one year and 4 were sprayed 2 years. In each group of 4 the spraying for the first year consisted of (1) 1 lb./A in grain, (2) 1 lb./A in stubble, (3) 1 lb./A in grain and 1 lb./A in stubble, (4) 1/2 lb./A in grain and 1 lb./A in stubble. All plots sprayed the second year had 1 lb./A in stubble. The remaining 4 pairs of plots had rye which was sprayed with the above 4 treatments the first year and had oats sprayed with 1/2 lb./A the 2nd year. The 3rd year was unsprayed oats.

Final weed counts were made in May, 1954. All plots that had been intensively cultivated for one year had 99% elimination. Sudan grass reduced the yield more than the other competitive crops, followed by buckwheat. Rye that was sprayed 2 consecutive years was more effective than rye followed by oats. The 1/2 lb./A rate prevented seed production and seemed to be as effective as the 1 lb./A rate on ultimate stand.

An identical experiment was started in 1951 and will be completed in 1955. The competitive ability of sudan grass appears to be even more outstanding in this experiment. These data indicate that 2,4-D is a supplement to cultural practices for controlling spurge. (Contributed by the Agronomy Department, South Dakota Agricultural Experiment Station, College Station, South Dakota).

Control of leafy spurge with Amizol. Pavlychenko, T. K. and Bestrop, A. J.. A large, dense infestation of leafy spurge (Euphorbia esula) was divided into three separate sections: the first treated with 3, amino 1,2,4-triazole (Amizol at 3, 6 and 16 lb./A) at pre-bud stage, the second treated with the same rates at bloom stage and the third mowed at bloom stage. In each section the rate plots were divided into four segments: (1) treated (or mowed) once, (2) treated (or mowed) followed by a retreatment when regrowth was in advanced rosette stage, (3) treated (or mowed) followed by a one-way disk cultivation when the regrowth was in bloom stage and (4) treated (or mowed), cultivated when regrowth was in bloom stage, followed by a retreatment when the second stand of regrowth was in the advanced rosette stage. The weed was growing on sandy loam soil and moisture was abundant. RESULTS: On the basis of one years records the following trends were observed: the topkill, although slower than with 2,4-D formulations, was complete with all rates; there was considerable regrowth following all treatments, the least amount being found in the section treated at pre-bud and the most in the section mowed at bloom stage; plots that were treated once generally showed less amounts of regrowth than those that received additional cultivation and/or retreatment; regrowth in most cases showed etiolation, ranging from only a few affected plants in plots that received one treatment to nearly all the plants being very strongly affected in plots that received additional cultivation and retreatment. At this time, it is impossible to form an opinion on the final effects of this new chemical, further observations on regrowth will be made in 1955. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Effect of a chlorate-borate compound on roots and reproductive buds on roots of leafy spurge. Selleck, G. W. and R. T. Coupland. Five pounds of Concentrated Borascu (61.5% B_2O_3) per 100 square feet applied in May 1954 on loamy sand at Saskatoon, killed the roots of leafy spurge (Euphorbia esula L.) to a depth of four inches beneath the soil surface by September, 1954. Six pounds of the chemical applied in September, 1953 resulted in destruction of roots to a depth of 6 inches. Some roots were killed completely, the lower portions (below 24 inches) being in a state of decomposition. Abnormal shoots were found arising from buds on apparently normal roots at depths of 6 and 18 inches. The shoots were twisted and distorted into white, swollen, lumpy masses, each about one-half inch in diameter. One bud at the 6-inch depth had formed two such masses which were connected by a one-inch length of thread-like white tissue. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Effect of various herbicides on leafy spurge (Euphorbia esula L.). Sylwester, E. P. and A. L. Bakke. Heavy stand of leafy spurge growing in northeastern part of the state of Iowa was treated with the following amounts of chemicals per square rod; (1) Chipman Chlorax, 5 lbs; (2) Polybor, 15 lbs; (3) Borascu, 25 lbs; (4) Atlacide 2,4-D, 5 lbs; (5) Amate, 3 lbs; (6) CMU (Karmex), 1/4 lb; (7) Amino triazole, 1 oz; (8) Dow Esteron, 12 cc; (9) Dow Kuron 12 cc; (10) Weedone L-V-4, 12 cc; (11) Dalapon, 1 oz; (12) Weedone 638, 12 cc; (13) ACP-L-659, 12 cc; (14) ACP-L-674, 12 cc. The leafy spurge at the time of treatment (July 2, 1954) was a foot high and in blossom up to well developed capsules. One gallon of liquid spray was applied per square rod and appropriate ones were applied dry. Observation on September 28, was as follows in terms of control on spurge; (1) -98 per cent, (2) -95 per cent, (3) -96 per cent, (4) -96 per cent, (5) -95 per cent, good growth of grass, (6) -5 per cent, grass killed, (7) -15 per cent, majority of spurge plants yellow, (8) -50 per cent, grass in excellent condition, indication of injury to milkweed, (9) -50 per cent, grass in excellent condition, (10) -0 per cent, no effect on spurge, 90 per cent of grass killed.

(12) -75 per cent, good growth of grass, (13) -75 per cent, milkweeds not killed, grass injured slightly, (14) -75 per cent, milkweed not killed, injured grass slightly. (Contributed by Agricultural Extension Service, and Agricultural Experiment Station, Iowa State College).

Hoary cress, Russian knapweed and bur ragweed

Paul F. Sand

Summary

Five abstracts were received, three on hoary cress, one on Russian knapweed and one on bur ragweed. Sylwester and Bakke report good control of hoary cress with 2 lbs/A of a brush killer. Pavlychenko reports good but slow top kills on hoary cress with 3, 6 and 16 lbs/A of amino trizol with the least amount of regrowth from treatments applied at the bloom stage. Brown reports almost complete elimination of hoary cress by applying 3-10 lbs. of 2,4-D per acre in the bud stage followed by intensive tillage for the remainder of the season.

One abstract on Russian knapweed reported good kills with 40 lbs. of 2,4-D per acre applied in the fall. Granular boron and boron chlorate mixtures also gave excellent kills.

Phillips reports good control of bur ragweed with sodium chlorate, boron compounds and boron 2,4-D complexes. CMU did not give satisfactory control of this weed.

Abstracts of Contributors

Hoary cress

Control of Hoary Cress. Brown, D. A. Prior to 1953 control of this weed by means of 2,4-D was obtained only by repeated applications of butyl esters at 1 to 3 lb. acid equivalent per acre. Treatments were made in June, August and October. Follow-up treatments were necessary through a second year. Work in 1953-54 has been confined to heavy applications from 3 to 10 lb/ac. acid of butyl ester 2,4-D made when the cress was in bud stage early in June. Intensive tillage for the remainder of the season has almost completely eradicated this weed on heavy Assiniboine clay soil. Experimental Farm, Brandon, Manitoba.

Control of hoary cress with Amizol. Pavlychenko, T. K. and Bestrop, A. J. A large infestation of hoary cress (Cardaria draba) was divided into three separate sections; the first treated with 3, amino 1,2,4-triazole (Amizol at 3, 6 and 16 lb/A) at pre-bud stage, the second treated with the same rates at bloom stage and the third mowed at bloom stage. In each section the rate plots were divided into four segments: (1) treated (or mowed) once, (2) treated (or mowed) followed by a retreatment when regrowth was in advanced rosette stage, (3) treated (or mowed), followed by a thorough one-way disking when the regrowth was in bloom stage and (4) treated (or mowed), cultivated when regrowth was in bloom stage, followed by a retreatment when the second stand of regrowth was in the advanced rosette stage. The weed was growing on clay loam soil and moisture was abundant. RESULTS: Preliminary observations denote the following general trends: topkill of the original growth was slow but complete in all treated plots; the regrowth was fairly scarce, being lowest in the section treated at the bloom stage and highest in the mowed section, lowest in the plots treated once and highest in the plots treated, cultivated and retreated; etiolation was very slight with all treatments; the 16 lb/A rate did not appear to be significantly superior to the 3 lb/A rate. At this time, no final opinion can be formed as to the effectiveness of the chemical. Further observations on regrowth will be made in 1955. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Effect of TCA, Dalapon CMU and "Brush Killer" on perennial pepper grass (Lepidium Draba L.) and downy brome grass (Bromus Tectorum L.) Sylwester, E. P. and A. L. Bakke. Square rod plots heavily infested with perennial pepper grass and downy brome grass were sprayed with TCA, 10 lbs. per acre, Dalapon 4 lbs., 8 lbs., 14 lbs., per acre, Brush Killer (50-50) 2 lbs. per acre, on April 28, 1954. Observation on June 30, disclosed that 10 lbs. TCA per acre had produced no effect on the downy brome grass nor the perennial pepper grass. Four lbs. of Dalapon was ineffective; eight lbs., Dalapon controlled seed production in the pepper grass but only reduced the downy brome infestation 50 per cent. Dalapon at the rate of 14 lbs. per acre controlled the downy brome but not the perennial pepper grass. Sour dock, annual sow thistle, ragweed and blue grass were severely hurt. Brush killer at the rate of 2 lbs. per acre killed the pepper grass but did not damage the downy brome. A plot treated with CMU at the rate of 40 lbs. per acre in 1953 had a small amount of perennial pepper grass in 1954 (1-2 per cent). Agricultural Extension Service and Agricultural Experiment Station - Iowa State Colle

Russian knapweed

Control of Russian knapweed (Centaurea repens) with 2,4-D. Sand, Paul F. and Shafer, Neal E. Triplicate square rod plots of Russian knapweed were treated with 2,4-D isopropyl ester at 2,4, and 40 lbs/A 2,4-D isooctyl ester at 2 and 4 lbs/A, 2,4-D (ACP 638) at 2 and 4 lbs/A, 2,4-D isopropyl ester at 30 lbs/A mixed with 10 lbs. CMU per acre on June 4, 1953 when the plants were in early bud stage. Fall applications applied November 12, 1953 were 2,4-D isopropyl ester, 2,4-D isooctyl ester, 2,4-D (ACP 638) all at 30 and 40 lbs/A, 2,4-D amine salt at 40 lbs/A, granular boron at 7.3 lbs/sq. rd. of B_2O_3 and boron chlorate mixture at 6 lbs/sq. rd. of active ingredient. Permanent square yard quadrate were established in the plots and stand counts made June 25, 1954. All of the spring treatments gave less than 50 percent control. The fall treatments that gave satisfactory control were; isopropyl ester at 30 and 40 lbs/A gave 88 and 100% kill, isooctyl ester at 30 and 40 lbs/A gave 98 and 100% kill, 2,4-D (ACP 638) at 30 and 40 lbs/A gave 98 and 98% kill, granular boron at 7.3 lbs. B_2O_3/sq. rd. gave 100% kill, boron chlorate mixture at 6 lbs. active ingredient/sq. rd. gave 100% kill and 40 lbs/A of 2,4-D amine salt gave 100% kill. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska)

Bur ragweed

Bur ragweed control with soil sterilizing chemicals. Phillips, W. M. Sodium chlorate at 640, 960, and 1,280 lbs./Ac., a soluble borate (77% sodium penta-borate) at 640, 960, 1,280 and 1,600 lbs./Ac., a borate-chlorate mixture (71% borate, 25% sodium chlorate) at 640, 960, 1,280, and 1,600 lbs./Ac., CMU at 40, 80, and 120 lbs./Ac. and several 2,4-D - boron complexes were applied to a heavy stand of bur ragweed in 1952 and 1953. Observations in the fall of 1954 showed that sodium chlorate at all rates was effective in reducing the stand of the weed. None of the plots treated with this material had more than 5% of the original stand of bur ragweed remaining. The soluble borate at 960, 1,280, and 1,600 lbs. was also very effective in reducing the stand of the weed. Of the chemicals tested CMU was least satisfactory. This chemical caused considerable reduction in stand and greatly reduced the vigor of the surviving plants but the weed was not eliminated by any of the CMU treatments. The 2,4-D - boron complexes applied at 640, and 960 lbs./Ac. gave a rapid top-kill and burning affect on the foliage and have prevented re-growth for a period of 16 months. (Contribution from Field Crops Research Branch, ARS, USDA and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas).

Toadflax and Other Perennial Herbaceous Weeds

Summary

H. A. Friesen

Twelve abstracts dealing with toadflax control were received from five investigators in Saskatchewan and Alberta. Keys and Forsberg report that on arable land a system of alternate cropping to a cereal grain and fallow, intensively cultivated, has reduced the stand of toadflax by 80 to 90 pct. or to the extent that the weed did not depress the grain yields. Two consecutive years of fallow before cropping did not enhance the degree of control obtained. 2,4-D ester at 2 lbs/A was effectively used to reduce the number of tillage operations required per season on the fallow. Seeding down to crested wheat grass without a preceding year of fallowing and then spraying with 2,4-D each year subdued the toadflax for a period of five years. However, when the sod was broken in 1954 the infestation was as heavy as the original stand. Carder reported that seeding to creeping red fescue, after a season of fallowing, and then spraying with 2,4-D has markedly reduced the stand of toadflax in each of the past 2 years. This was not true when brome grass was used in this way. Keys and Forsberg report that CMU at 40, 80 and 100 lbs/A has prevented regrowth of toadflax for the past four years. P.D.U. and Compound 2049 applied in 1953 have controlled toadflax as effectively as CMU when used at comparable rates. Borate-2,4-D compounds at 3 lbs/A appeared very promising in separate trials by Sterling, Beck and Coupland in 1954. Coupland obtained better control with concentrated Borascu than with Polybor-chlorate at 3 lb/100 sq.ft. 2,4-D ester and amine at 50 lbs/A has given only some 25 pct. control whereas at 155 lbs/A the control was 95-97 pct. Amino triazole or mixtures of 2,4-D and HCL or Conc. H_2SO_4 did not look promising in 1954.

Field horsetail was effectively controlled in 1954 by Dalapon at 20 lbs/A, borate-2,4-D spray at 1370 lbs/A, Karmex FW at 30 lbs/A and boron-CMU mixture at 300 lbs/A applied when the weed was 3 inches tall. Amino triazole at 10 lbs/A and 2,4-D at 1½ lbs/A applied when the horsetail was 6" tall gave excellent control, as did the treatments given above when applied at this stage of growth.

Poverty weed suffered complete top killing and regrowth was prevented in 1954 by the application of 2,4-D ester at 25 lbs/A when the weed was some 4 inches tall.

Wild garlic treated with 2,4-D butoxy ethanol ester and 2,4-D ethyl ester in 1953 was reduced in stand by 95 and 92 pct., respectively in 1954. Similarly MH at 6 lbs/A gave a 92 pct. reduction in stand while MCP diethanolamine at 2.5 lbs/A reduced the stand by only 33 pct. in 1954.

Cattails treated with Dalapon, TCA abd CMU at 5 and 10 lbs/A when the plants were 5 inches tall were 95 to 100 pct. eliminated.

Abstracts

EFFECT of herbicides on toadflax. Beck, T.V. Plots of toadflax were treated in May 1954 with polybor-chlorate as a spray and two complex compounds of sodium borate and 2,4-D acid (DB spray powder and DB Granular).

In October 1954 DB granular and DB spray powder at one pound per 100 sq[u]
feet showed 92% control of toadflax. Polybor-chlorate and DB spray powd[er]
at the 2 and 3 pound rates per 100 square feet showed 100% control. Gra[ss]
growth remained on all plots. Further inspection must be made next year.

CONTROL of toadflax by 2,4-D in combination with a competitive gra[ss]
Carder, A. C. An area heavily infested with toadflax, Linaria vulgaris,
was intensively cultivated in 1952. In the spring of 1953 one half the
area was seeded to creeping red fescue, the other half to brome. Good
stands of grass were obtained along with a considerable growth of toadfla[x]
consisting of seedlings and resprouts from established plants. No nurse-
crop was used with the grass. In the summers of 1953 and 1954 when the
toadflax was in late bud the butyl ester of 2,4-D was applied at nil, 1,
3 and 4 lb/A acid equivalent in a water spray at the rate of 5 gal/A.
Appraisal of suppression of toadflax was made in the fall of each year
treatment was carried out. Results are as follows:

Rate 2,4-D lbs/A	Percentage survival			
	Creeping red fescue		Brome	
	1953	1954	1953	1954
Nil	100	100	100	100
1	90	68	60	74
2	80	51	50	61
3	40	28	30	32
4	30	20	30	22

The data indicate that in all instances there is greater suppression of
toadflax with the heavier rates of 2,4-D and that there is continued
reduction in stand of toadflax by perennial treatment in the case of fesc[ue]
but not in the case of brome, except with the 4-lb. rate. Wherever one
or more pounds of the 2,4-D had been applied no viable toadflax seed was
produced in either year. (Contribution of Experimental Station, Beaver-
lodge, Alberta)

THE effect of different herbicides on toadflax, (Linaria vulgaris)
Carder, A. C. Three chemicals were used: sodium chlorate, CMU and PDU
(phenyldimethylurea). All applications were made in 1953. The sodium
chlorate was applied dry at three different rates and growth stages of th[e]
toadflax. The effects of the various applications were appraised in the
autumn of 1953 and again in the early summer of 1954. The CMU was applie[d]
in a water spray at the rate of 80 gal/A. Five different rates were used
and applications were made when the toadflax was in late bud and in the
fall. The PDU was applied in the same manner as the CMU but only when th[e]
toadflax was in late bud. The effectiveness of the CMU and PDU treatment[s]
was appraised in the autumns of 1953 and 1954. The results of these vari[ous]
treatments are shown in the table. For some reason sodium chlorate seems
more lethal when applied in the summer or fall rather than in the spring.
Complete kills were obtained at all growth stages tested by 4 or more
pounds per sq. rod. In one instance 60 lb/A of CMU failed to effect a
complete kill, while 50 lb did not seem enough. There was little differe[nce]
whether the chemical was applied in the late bud or in the autumn. PDU w[as]
shown to have about the same potency as CMU. The 40-lb rate did not com-
plete eradication. (Contribution of Experimental Station, Beaverlodge,
Alberta)

Carder - Herbicides on toadflax

Growth stage	Sodium chlorate Lb/ sq.rd.	Sodium chlorate % survival 1953	Sodium chlorate % survival 1954	CMU Lb/A	CMU % survival 1953	CMU % survival 1954	PDU Lb/A	PDU % survival 1953	PDU % survival 1954
Spring Rosette	2	3.5	6.5						
	4	2.0	0						
	6	1.0	0						
Late bud	2	2.0	0.5	20	60	40.0	20	80.0	42.5
	4	0	0	30	25	17.5	40	35.0	5.0
	6	0	0	40	12	10.0	80	3.5	0
				50	6	2.5	100	1.5	0
				60	5	1.5			
In autumn, post seed-set	2	-	0.5	20	-	37.5			
	4	-	0	30	-	13.5			
	6	-	0	40	-	6.0			
				50	-	8.5			
				60	-	0.0			

EFFECT of Concentrated Borascu on toadflax, 1954. Coupland, R.T. Five dense stands of toadflax (Linaria vulgaris Hill) on sandy land near Rosthern were treated with Concentrated Borascu (61.5% B_2O_3) at rates ranging from 1 to 7 lb. per 100 sq. ft. Four stands were treated on Sept. 15 and 16, 1953 and one was treated on May 19, 1954. Notes were taken on May 19 and Sept. 20, 1954. Fall application in 1953 at a rate of 1, 2, 3, 4, 5 and 6 lb. on the weed in competition with brome grass (Bromus inermis Leyss.) resulted in no regrowth of toadflax during 1954. Fall treatments at 4, 5, 6 and 7 lb. on the weed in competition with couch grass (Agropyron repens (l.) Beauv.) resulted in no regrowth of toadflax throughout 1954, except for a few shoots (99% control) in one plot. Spring application at 1, 2, 3, 4, 5 and 6 lb. on a similar stand permitted no regrowth of toadflax by fall except for a few shoots (99% control) in one plot. Fall treatment to toadflax in a rye field at 1 and 2 lb. per 100 sq. ft. prevented 98 to 99 per cent regrowth in 1954, while treatments at 3, 4, 5 and 6 lb. gave complete control of toadflax. Fall treatment at 4, 5, 6 and 7 lb. of toadflax which had invaded native grassland and shrub resulted in 99 to 100% control one year later. This herbicide was more effective than Polybor Chlorate in controlling toadflax. Fall application at the 1 lb. rate permitted 95% regrowth of brome grass during the year following treatment. Regrowth of brome, couch and native grasses ranged from 10 to 50% in areas treated with 2 to 4 lb. in the fall. Heavier rates reduced regrowth to 5% or less. Spring treatment at 1 to 3 lb. per 100 sq. ft. permitted 100% regrowth of couch grass by fall; 4 to 6 lb. permitted 75 to 85% regrowth. (Contribution from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Saskatchewan with financial assistance from the Saskatchewan Agricultural Research Foundation)

EFFECT of borate-chlorate mixture on toadflax, 1954. Coupland, R.T. Five dense stands of toadflax (Linaria vulgaris Hill) on sandy soil near Rosthern were treated with Polybor Chlorate (75% borates, 25% sodium chlorate) at rates of 1, 1.5, 2, 2.5 and 3 lb. per sq. ft. (0.5 lb. was also applied in two tests). Four stands were treated on Sept. 15 and 16,

1953 and one was treated on May 19, 1954. Notes of control were taken on May 19 and Sept. 20, 1954. Fall application in 1953 at 0.5 to 3 lb. rates on the weed in competition with brome grass (Bromus inermis Leyss. resulted in 98 to 100% control of toadflax throughout 1954. Fall treatm at 1 to 3 lb. rates on the weed in competition with couch grass (Agropyr repens (1) Beauv.) resulted in no regrowth in May but control of toadfla was only 90 to 96% by one full year after treatment. Spring application at the same rates caused 9 to 100% control by fall. Fall treatment of toadflax in a field of rye at 0.5 to 3 lb. per 100 sq. ft. prevented all regrowth in the spring, but control of the weed was only 60 to 94% by the fall of 1954. Fall treatment at 1 to 3 lb. to toadflax which had invaded native grassland and shrub resulted in 60 to 94% control one year later. This herbicide was not as effective as concentrated Borascu in controlling toadflax. Fall application of 0.5 lb. permitted 25% regrowth of brome grass the following year, but no regrowth occurred at rates of 2 lb. or greater. Couch grass regrowth was 100% from 1 lb. applied in the fall but was reduced to 20 to 60% following the heavier fall treatments. While native grass regrew 20% after the application of 1 lb., heavier treatments prevented regrowth greater than 5%. Spring applicatio of 1 or 1.5 lb. permitted 100% regrowth of couch grass by fall, 2 lb. permitted 75% regrowth, but heavier applications reduced the regrow markedly. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask. with financial assistance from the Saskatchewan Agricultural Research Foundation.)

EFFECT of 2,4-D at high rates on toadflax, 1954. Zilke, S and R.T. Coupland. Stands of toadflax (Linaria vulgaris Hill) on sandy soil near Rosthern were treated with alkanolamine and butoxy ethanol ester of 2,4-D in June, 1954. Amine applied on June 4 at 50 lb. per acre to the weed in competition with couch grass provided 35% control by October, while the degree of control obtained from 85, 120 and 155 lb. per acre was 95, 98 a 97%, respectively. Amine applied to a very dense stand of toadflax in competition with sweet grass on June 18 at 50, 85, 120, 155, 200, 250 and 300 lb. per acre provided up to 5% control of the weed by October. Treatment of toadflax growing in native grassland and shrub with the ester and amine on June 2 provided 20 to 25% control at 50 lb. per acre and 85 to 95% at 155 lb. per acre. The grass in all plots remained undamaged and in many it was much more dense by fall. (Contribution from the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

EFFECT of mixtures of borax compounds and 2,4-D on toadflax, 1954. Coupland, R. T. A dense stand of toadflax (Linaria vulgaris Hill) was treated on sandy land near Rosthern on May 19, 1954 with a comples of sodium borate (B_2O_3 - 40.9%) and 2,4-D (acid equivalent - 7%) applied dry at 1, 2 and 3 lb. per 100 sq. ft. and a similar complex (59.5% B_2O_3 and 7% 2,4-D) applied in water at the same rates. Four months after treatment no growth of toadflax could be found in the plots treated with the dry material, while control was 90 to 100% in the sprayed plots. Regrowth of couch grass was 100% by fall in the plots treated with the former herbicide and 80 to 100% in sprayed plots. (Contribution from the Dept. of Plant Ecolo University of Saskatchewan, Saskatoon, Sask.)

TILLAGE and cropping methods for the control of Toadflax (Linaria vulgaris) Keys, C. H. and Forsberg D. E. Some of the tillage and croppi practices being followed since 1949 were revised in 1954. Rotations have been confined to those of two or three years duration while tillage

practices now include after-harvest tillage with blade weeder, intensive tillage of fallow-meaning, no top growth allowed, fallow tilled when top growth has been in evidence about eight days and continuous fallow until toadflax has been erradicated. In an area where system of alternate fallo and crop has been adhered to since 1949 it is estimated that the toadflax has been reduced by some 80-90 percent. A three year rotation of fallow, wheat and coarse grain, which is considered a standard rotation under normal conditions in the area, has been conducive to the enlargement of the patches with little or no reduction of plants within the patch. The practice of two years fallow and crop has not given much better control than the alternate fallow and crop system. Due to the very moist fallow season some difficulty was encountered in following some of the tillage practices as desired. A rod weeder was used quite successfully when rainfall had not made penetration too difficult. The coil shank cultivato with 15" sweeps was most frequently used for tillage operations. Ten operations were required this year to keep top growth controlled. Eight operations were required where top growth was permitted for a period of about eight days between operations. (Contributed by the Experimental Station, Scott, Sask.)

COMBINATION of tillage and chemicals for control of toadflax (Linaria vulgaris) Keys, C. H. and Forsberg, D. E. The practice of alternate tillage and spraying of fallow was begun in 1954. 2,4-D ester at 2 lb/acre was used as the spray treatment when the toadflax was about three inches high or had about ten days top growth. The one-way, cultivator and rod weeder were the tillage implements used. The use of 2,4-D resulted in a reduction of the number of operations. Top growth control was more complete than with tillage alone due to moisture being so abundant that plants in lumps of soil were not destroyed but remained to take root again. A portion of a second plot, after being plowed, was divided into 1/40 acre plots and single treatments of the following chemicals were applied: (1) Atlicide at 30 lb/A.; (2) Polybor chlorate at 80 lb/A.; (3) CMU at 10 lb/A.; (4) 2,4-D ester at 10 lb/A. The chemicals were applied August 12 when the toadflax had reached a height of four inches. All treatments have resulted in complete control of top growth to date and no subsequent tillage has been required. The full significance of these fallow treatments will not be known until 1955 when crop is grown on the treated areas. (Contributed by the Experimental Station, Scott, Sask.)

EFFECT of regrassing on the control of toadflax (Linaria vulgaris) Keys, C. H. and Forsberg, D. E. In the fall of 1948 a small area of land heavily infested with toadflax was seeded down to crested wheat. From 1949-1953 inclusive portions of the grassed area was sprayed with 2,4-D ester and amine at rates ranging from .5 to 4 lb/A. The 2,4-D retarded the top growth sufficiently to allow the grass to become well established in the patches of toadflax by mid-summer of 1952. In October 1953 it was estimated that the heavy rates (3 and 4 lb/A) reduced the stands of toadflax by some 60 pct. as compared to the check or unsprayed portion. On May 31, 1954 most of the crested wheat was broken up and worked down. Regrowth previous to the fifth cultivation after breaking was estimated to be nearly 100 percent of the origional stand. There was no apparent reduction as a result of previous 2,4-D treatments. In effect, the use of created wheat grass and 2,4-D subdued the growth of toadflax but soon after the sod was broken the growth of toadflax appeared to be as strong

as ever. The portion of the grass stand that remained held the toadflax in check without the aid of 2,4-D. (Contributed by the Experimental Station, Scott, Sask.)

EFFECT of herbicides on toadflax (Linaria vulgaris) Keys, C. H. and Forsberg, D. E. Plots treated with sodium chlorate at 1.2 and 3 lb/100 sq. ft.; polybor chlorate at 3 lb/100 sq. feet and borascu at 6 lb/100 sq. feet; MH at 24 lb/A and DNOSBP (general) at 10 gal/A mixed with diesel oil at 160 gallons/A.; CMU and TCA at 20, 40, 80 and 100 lb/A. in May, 1951 were fallowed in 1954. It was noted during the season that regrowth of toadflax appeared on all plots except those treated with 40, 80 and 100 lb/A of CMU and DNOSBP at 10 gal/A. in diesel fuel.

CMU and compound 2049 were each sprayed at 20, 40, 80 and 100 lbs/A. in 1953 to compare their effectiveness. In 1954 there was no growth on plots sprayed with either chemical at the 80 and 100 lb. rate. A few sickly plants remained on the plots receiving 40 lb/A. while the kill at 20 lb/A. was quite spotty.

In 1954 square rod plots, quite heavily infested with toadflax were sprayed with the following chemicals: 2,4-D ester at 2 lb/A. and Hydrochloric acid at 3.2 litres/A.; 2,4-D ester at 2 lb/A. and (6N) H_2SO_4 at 12 litres/A.; 2,4-D ester at 10, 15, 20, 25 and 40 lb/A. acid equivalent; sodium chlorate at 3, 6 and 9 lb/sq. rod. MH 30 and LV-4 at 5 and 10 lb/A amino triazole at 1 and 2 lb/A.; 3 phenyl - 1, 1 dimethylurea (Karmex FW) at 40 and 80 lb/A. and CMU (Karmex W) at 40 and 80 lb/A. All treatments containing 2,4-D were sprayed at two dates, pre-bud stage on June 18th and pre-bloom stage on July 19th. All plots receiving 2,4-D, at the pre-bud stage, singly or in combination with hydrochloric or sulphuric acid showed considerable regrowth by mid-August. Top growth control was much better when sprayed at the pre-bloom stage. MH and LV-4 gave temporary control only. Plots treated with sodium chlorate, Karmex W and Karmex FW resulted in complete top growth control. Amino triazole at both rates resulted in good top growth control until late fall when there were indications of the development of new shoots. (Contributed by the Experimental Station, Scott, Sask.)

TOADFLAX control with mixtures of borates and 2,4-D. Sterling, G. R. and Harvey, R. H. Plots of 1, 2 and 3 lbs per 100 square foot of mixture of 2,4-D and borates (DB Spray and DB Granular Pacific Coast Borax Co.,) both in the spray (DB Spray) and dry form (DB Granular) were established at Wetaskiwin in May 1954, inspected October 4th. DB spray at 3 lbs. gave 100% control. The 2 and 1 lb. rates contained a few seedlings. The DB granular showed slightly less control than the wet application. The writer inspected similar plots established at Rivercourse in June 1953 and Marsden in the fall of 53. Results on October 5th were good.

EFFECT of various herbicides applied to field horsetail. Wood, H. E., Mants, J. R. Some 20 miles north of Winnipeg on heavy clay loam, a field seeded to grass the year previous and having a portion very heavily infested with field horsetail (Equisetum arvense L.) was selected for knapsack applying herbicides as follows (lime and granulars applied dry by sprinkling): June 4 when horsetail was passing from 'fertile' stage to 'sterile' and growth was emerging to 3" in height (rather too early to treat), Dalapon 20 lb./A; DB Granular and DB Powder (boron + 2,4-D compounds) 1370 lbs./A; CMU (Karmex W, Karmex DW, Karmex FW) each 30 lbs./A; amino triazol 5 and 10 lb./A; a boron + CMU compound (Nalco N-174) 300 lbs./A; lime 800 and 4,000 lbs./A; 2,4-D low volatile ester, standard ester and emulsif

able acid 1½ lbs/A. Plots of a second series were treated July 8, when the horsetail was about 6" high, changes being as follows: Dalapon at 20 and 40 lbs/A. Karmex DW omitted, as also lime and Nalco. While final appraisal will be made in June 1955, results to the end of August were as follows: Lime gave no results; Dalapon almost 100% horsetail control, with grass mostly surviving on Granular but little on Powder; Karmex FW was the more effective of the three CMU products, the DW formulation rather less so on the later application (little or no control the early treatment), with all grass destroyed; Nalco gave almost complete control of both weed and grass (probably 100% if distribution could have been made evenly); amino triazole at the later date gave a large measure of control at 5 lbs. nearly complete at 10 lbs., the grass in both recovering from an initial setback; the 2,4-D formulation applied at the early date gave little or no control but at the second date were very effective giving almost 100% control, the low volatile being hardly as effective as the other two. (Contribution from the Weeds Commission, Manitoba Dept. of Agriculture, Winnipeg, Canada).

CHEMICALS for controlling poverty weed. Molberg, E. S. Amino triazol at 3, 6 and 16 pounds per acre, 2,4-D ester at 5 and 25 pounds per acre, and D.B. granular at 1 pound per 100 sq. ft. (all active ingredient) were applied to poverty weed growing in flax when the weeds were 3 to 4 inches high. The only treatment giving a complete kill was the 25 pound rate of 2,4-D. The 5 pound rate had no visible effect. The 16 pound rate of amino triazole and the D.B. granular reduced the stand of poverty weed slightly but could not be considered satisfactory control measures. (Contributed by Experimental Sub-Station, Regina, Saskatchewan).

RATES and formulations study of herbicides on wild garlic (Allium vineale). Szabo, Steve S. and J. W. Zahnley. Three series of plots, 25 square feet per plot, of wild garlic were treated on April 28, May 30, and July 8, 1953, with 2,4-D, MCP, and Maleic hydrazide. Applications of 1.5, 2.0, 2.5, and 1.5 (0.5 lb. at approximately 30 day intervals) lbs/A, of the low volatile butoxy ethanol ester of 2,4-D resulted in 99.3%, 99.0%, 99.3%, and 96.0% control, respectively. The same rates of the high volatile ethyl ester of 2,4-D resulted in 98.3%, 98.3%, 97.7%, and 68.3% control, respectively. Applications of 1.0, 1.5, 2.0, and 1.5 (0.5 lb. at approximately 30 day intervals) lbs/A of the diethanolamine salt of MCP gave 33.3%, 38.3%, 55.3%, and 38.3% control, respectively. Applications of 4.0, 6.0, 8.0, and 6.0 (2 lbs. at approximately 30 day intervals) lb/A, MH resulted in 99.0%, 99.0%, 99.3%, and 89.7% control, respectively. The percentage control was based on the percent of Fall regrowth as compared to that of the check plots. At the end of the second growing season (Oct. 25, 1954) approximately 18 months after treatment the comparative figures for reduction in stand were: Low volatile ester 90%, 95%, 95% and 70%; High volatile ester 84%, 92%, 92% and 55%; MCP 22%, 25%, 33% and 24%; MH 84%, 92%, 93% and 55%. (Contribution of the Kansas Agricultural Experimental Station).

CHEMICAL control of cattail (Typha latifolia L.) Sylwester, E. P. and A. L. Bakke. The borders of lakes and ponds, edges of drainage ditches and sloughs offer and environment conducive to the growth of cattails. With the continual and increasing establishment of artificial lakes and farm ponds interest is increasing in the control of cattails. While often desirable and not obnoxious in native habitat, farmers are much concerned

about their rapid invasion of man-made farm ponds. At Denison, Iowa in the western part of the state, square rod plots were staked out in a heavily infested cattail area, to determine the effectiveness of such herbicides as Dalapon, TCA and CMU at rates of 5 and 10 lbs. per acre. At the time of the spray application, the cattails were 5 inches in height. On July 30, the cattails had been eliminated 95-100 percent in all of the plots. Since there were some perennial marsh grasses present at the time of observation, it appears that cattails can be controlled more readily than the grasses. (Agricultural Extension Service and Agricultural Experiment Station, Iowa State College.)

ANNUAL, WINTER-ANNUAL, AND BIENNIAL WEEDS

Summary

R. S. Dunham

Thirty-one abstracts were received for entry in this section. An additional 19 abstracts reporting results of selective spraying for annual and biennial weeds may be found in the following sections: Flax, Spring Sown Grains, Soybeans and Peas, Sugar Beets, Vegetables, and Basic Studies in Botany, Ecology, and Plant Physiology.

Of the 31 abstracts in this section, 14 report results with wild oats. Of the 19 additional abstracts, 6 are also reports on wild oats control. Twenty-three herbicides or different formulations of an herbicide were tried on this weed. The list includes 2,4-D amine, butoxy ethanol ester, and butyl ester; 2,4,5-T low volatile ester; MCP amine, sodium salt, and butyl ester; 3,4-D amine; IPC emulsifiable and wettable powder; CIPC; 2-chloro ethyl N-(3 chloro phenyl)-carbamate (T-595); dichloral urea (DCU); TCA sodium salt; SES; CMU; Boron-CMU (Naco H-174); 2,2-dichloropropionic acid (Dalapon); Endothal; MH; NP; DNBP; and an Aromatic Oil.

Promising results with IPC or CIPC have been reported by several investigators. It is important to point out, however, that in trials where the wild oats are sown and the herbicide is disked in, conditions are optimum for a kill and do not represent the conditions prevailing under a natural infestation. Studies by Wiese (unpublished) have shown that seeds below the level of the IPC or CIPC can germinate and the seedlings emerge successfully and further, that a rate that is effective when mixed with a 2-inch layer of soil may be too dilute if mixed with a 3 or 4-inch layer. Several investigators have reported the wide difference in crop tolerance. Field peas, soybeans, sugar beets, sunflowers, rape, potatoes, and alfalfa have shown more tolerance than corn, small grains, and flax. The effect of temperature on the inactivation of IPC and CIPC and the relation of time of application to response of both wild oats and crops were investigated by Wiese and Dunham.

Dalapon was found effective especially when applied to wild oats in the tillering stage but rates required were too damaging to most crops. Sugar beets, rape, and potatoes proved more tolerant than peas and sunflowers and the latter more tolerant than corn, soybeans, small grains and flax.

Some investigators reported successful control of wild oats with TCA, especially when applied in the fall. DNBP in diesel oil was effective as a post-emergence spray. Both Dalapon and MH prevented heading of wild oats. The dinitro, Dalapon, and MH were not applied selectively.

Forsberg found that a standard or a low volatile rate of 2,4-D applied three times at weekly intervals to wild buckwheat gave a very satisfactory control of the weed and did not injure wheat in which it was growing. Shebeski and Burrows obtained excellent control of the same species with 8 oz of 2,4-D amine or butoxy ethanol ester; 4 oz of MCP sodium salt; 5 lb of Amizol; or 4½ lb of dinitro-ortho-cresol (Denocate). There was no crop involved. Brown reported from 73 to 80% kill of wild buckwheat in oats with 6 oz/A of either a low volatile ester of 2,4-D or a standard ester of MCP. The sodium salt of MCP checked seed formation in Tartary buckwheat and a combination of 2,4-D butyl ester or MCP butyl ester with CMU killed about 25% of the plants and severely stunted the rest.

Both CMU and Dalapon were effective in killing downy bromegrass. An interesting comparison of Endothal, Dalapon, and TCA applied to Setaria lutescens at different stages was reported by Andersen and Helgeson. Endothal was relatively ineffective at all stages (2-8 leaf, tiller, and boot); Dalapon was relatively more effective than TCA; and both Dalapon and TCA gave excellent control at the 2-8 leaf stage but less Dalapon was required. The control of crabgrass in crops depended largely on moisture conditions and only large seeded crops could be used successfully in an Oklahoma trial.

The specificity of MCP on hemp nettle, mentioned in a former summary, was attested by two trials in Canada this year. Amizol was also effective but could not be used selectively in durum wheat. In other investigations, 2,4-D ester controlled dog mustard better than MCP formulations; lady's thumb was more susceptible to MCP sodium salt than MCP amine or ester and more susceptible to 2,4-D ester than MCP formulations; corn cockle was tolerant of MCP and 2,4-D ester; and corn spurrey was not affected by 2,4-D butyl ester or propylene glycol butyl ether ester or by MCP butyl ester, potassium salt or amine.

Unsatisfactory control of grassy weeds with Dalapon applied by plane was reported by Phillips. Excellent selective control of broadleaved and grassy weeds in corn with 3-(3,4-dichloro phenyl)-1,1-dimethyl urea (D) was obtained by Buchholtz. Furrer and Sand used CMU in combination with 2,4-D to control miscellaneous weed species on irrigation canals.

Abstracts

Effect of spring application of IPC and 2-chloroethyl N- (3-chloro phenyl) (T-595) for the control of wild oats (Avena fatua). Andersen, E. T. and Smits, O. Wild oats were broadcast and worked in by Rototiller to a depth of 4-5 in on May 20, 1954. The following day IPC and T-595 were applied at 4 and 6 lb/A in 50 gal of water, and incorporated into the top 2 in of soil. On June 2 several horticultural crops (peas, soybeans, sugar beets, sunflowers, rape, potatoes, and corn), were seeded at right angles to the chemical treatments. Results: None of the crops showed any damage from the IPC treatment, but wild oats was controlled 70 and 90% from the 4 and 6 lb rates respectively. Volunteer green foxtail and wild mustard also grew normally. T-595 had no apparent effect on wild oats, green foxtail, wild mustard or crop plants. T-595 was further investigated as a post-emergent spray, being applied on July 5, again at 4 and 6 lb/A. This post-emergence treatment controlled wild mustard 50 and 70% respectively for the 2 rates, had no effect on wild oats or green foxtail, and caused some stunting in all crop plants. (Contribution from the Division of Plant Science, University of Manitoba. Approved for publication).

Control of wild oats (Avena fatua) with Dalapon. Andersen, Robert N. and Helgeson, E. A. Wild oat seed was drilled into Fargo clay soil in the spring of 1954. Dalapon at the rates of 4, 6, 8, 12, and 16 lb/A was applied in 40 gal of aqueous solution/A. Applications were made post-emergently at four stages of growth. Results: The oven dry wt of shoot material collected 6 weeks after treatment was used as one measure of control. By this criterion, applications in the seedling stage (2-3 in tall) gave 52, 56, 74, 78, and 85% control at 4, 6, 8, 12, and 16 lb/A respectively. Applications in the early tillering stage (4-6 in tall) gave 95, 96, 98, 99, and 98% control. Quantitative measurements of living shoot material were not made on the last two stages of growth. However, control from treatments applied in the fully tillered stage (12-14 in tall) appeared to be about equal to those of the early tillering stage. Applications

in the boot stage (22-27 in tall) were too late to have much effect on amount of vegetative material produced. Estimates of the control of heading were made on all plots at maturity. Applications in the seedling stage gave 78, 92, 98, 99, and 100% control of heading, while those in the early tillering stage gave 99, 100, 100, 100, and 100% control. Application in the fully tillered stage gave 97, 99, 99, 100, and 100% control of heading, while applications in the boot stage gave 22, 32, 36, 36, and 40% control. It appears that rates as low as 4 lb of Dalapon/A may be sufficient for control of wild oats. Better control was obtained from treatments in the early tillering stage (4-6 in tall) than from treatments in the seedling stage (2-3 in tall). (Field Crops Research Branch, A.R.S., U.S. Dept. of Agric., and North Dakota Agr. Exp. Sta., Fargo, N.D. Approved for publication by Director of Exp. Station).

Comparison of three herbicides applied at three stages of growth to Setaria spp. Andersen, Robert N. and Helgeson, E. A. Endothal at the rate of 1, 2, and 4 lb active ingredient/A; Dalapon at 1, 2, and 4 lb acid equiv/A; and TCA at 4 and 8 lb acid equiv/A were applied to Setaria spp. (mostly lutescens, small amount of viridis). Applications were made in 40 gal of aqueous solution/A and were applied at three stages of growth. Results: When applied in the 2-8 leaf stage ($\frac{1}{2}$ in - 6 in tall), Endothal gave only 28% control at the 4 lb rate, while Dalapon gave 78, 96, and 98% control at 1, 2, and 4 lb/A respectively. At this stage TCA gave 89% at 4 lb and 94% control at 8 lb/A. When applied in the tillering stage (6-12 in tall), Endothal gave practically no control, Dalapon gave 51, 78, and 88% control at 1, 2, and 4 lb/A respectively. In the tillering stage TCA gave only 11% control at 4 lb and 38% at 8 lb/A. When applied in the boot stage, both Endothal and TCA gave practically no control while Dalapon gave 1%, 24%, and 36% control at 1, 2, and 4 lb/A. In all cases, 2 lb of Dalapon gave better results than 4 lb of TCA. Likewise, 4 lb of Dalapon was better than 8 lb of TCA. The superiority of Dalapon over TCA was most pronounced at the two later, more resistant stages. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N.D. Approved for publication by Director of Experiment Station).

Effect of Dalapon and CMU on downy bromegrass (Bromus tectorum L.) Bakke, A. L. and Sylwester, E. P. A heavily infested area of downy bromegrass along a roadside was sprayed on April 28, 1954 with Dalapon at 4, 6, and 10 lb/A rates and CMU at 4, 6, and 10 lb/A rates. The downy brome at spraying time was 2-4 in high and was the only weed in evidence. Volunteer alfalfa, water leaf, wild four o'clock, sheep sorrel, goats beard, morning glory and blue grass appeared later. Readings were made in May, July and September. Results: Dalapon at all rates was effective in killing the downy bromegrass. Volunteer alfalfa, water leaf, wild four o'clock, sheep sorrel, goats beard, morning glory and blue grass were all badly hurt. Small ragweed was inhibited at the 10 lb/A rate. Perennials partially recovered toward the end of the season. CMU at all rates was effective in killing the downy bromegrass. Volunteer smooth dock, blue grass, quack grass, morning glory, wild four o'clock, alfalfa, sheep sorrel and goats beard were all badly hurt but perennials partially recovered toward the end of the season. (Agricultural Experiment Station and Agricultural Extension Service. Iowa State College).

Low volatile esters for control of wild buckwheat. Brown, D. A. A heavy stand of wild buckwheat (P convolvulus) in a crop of oats was treated when the oats plants were 7 in tall and buckwheat seedlings had 2-5 true leaves. Treatments were replicated 4 times. Numbers of buckwheat plants were estimated prior to treatment and percentage kill was calculated after treatment using checks for comparison.

Results in per cent kill were as follows: - Dow L.V. 10-10 3 oz/A 76%, 6 oz - 78%. ACP L-V 4 3 oz/A 68%, 6 oz - 80%. MCP low volatile 3 oz/A 56%, 6 oz - 73%. MCP standard ester 3 oz/A 53%, 6 oz - 68%. (Contributed by Experimental Farm, Brandon, Manitoba).

Selective weed control in corn with foliage sprays of 3-(3,4-dichlorophenyl)-1,1-dimethyl urea and DNBP. Buchholtz, K. P. Corn hybrid W575 was planted on May 26 on an area that had been sown to mustard greens and millet. Plots were sprayed on June 11 with a liquid preparation of 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (D) and an amine preparation of DNBP alone and in several combinations. At time of spraying the corn had 3 leaves, the foxtail was about 2 in tall and the mustard and other broadleaved weeds had 2 true leaves. Spray equivalent to 20 gal/A was applied. No cultivation was given any plot throughout the season. On July 19 weeds were harvested from quadrats in each plot and dry weights determined. The heights of the corn plants were measured on July 8. At maturity the corn was harvested and yields of grain calculated. Results: The application of 2 lb/A of D was effective in killing all weeds which had emerged and provided residual control for at least 2 months more. DNBP gave initial control of grasses and broadleaved weeds but regrowth of grasses was vigorous. Combinations of D with DNBP gave a more rapid weed kill but final control was not greatly different than that obtained when D was applied alone. It was evident that initial weed kill with combinations was chiefly due to contact effects. Many plots which received 1 or 2 lb/A of D in the combination were still nearly free of weeds at harvest.

Material	Applic. lb/A	Dry wt. weeds, lb/A 7/19 Broadleaved	Grasses	Corn height in 7/8	Corn yield bu/A
Check	--	1427	3239	41.9	52.0
DNBP	4	70**	2821	41.4	108.7**
D	2	0**	0**	34.8*	106.2**
DNBP + D	1 + 0.5	6**	1833*	39.3*	97.6**
"	1 + 1	0**	473**	37.9**	105.0**
"	1 + 2	0**	6**	32.6**	104.0**
"	2 + 0.5	0**	1126**	37.2**	100.1**
"	2 + 1	0**	581**	37.9**	115.0**
"	2 + 2	0**	60**	31.0**	113.9**
"	4 + 0.5	12**	1288**	37.6**	110.9**
"	4 + 1	12**	478**	33.8**	110.2**
"	4 + 2	0**	24**	32.8**	101.2**

The corn leaf injury varied from slight to severe as a result of the treatments. On July 8 all treatments had reduced the height of the corn but stands had not been affected. The corn made an excellent recovery and grain yields from treated plots were all greatly more than the yields on uncultivated, untreated check plots. (Dept. of Agronomy, Univ. of Wisconsin. Approved for publication by Director of Exp. Station).

The effect of 2,4-D and MCP on dog mustard and other weeds. Craig, H. A., Hill, D.J. and Arnal, A. G. At two locations in northern Manitoba, sq rd plots of dog mustard (Erucastrum gallicum) in grain fields were knapsack sprayed in early July when the mustard was emerging to 3rd leaf, using 160 Imperial gal water/A. MCP sodium salt, amine and ester at 8 and 16 oz/A were compared with similar dosages of 2,4-D ester. Results: All formulations at the 16 oz rate

gave 90 to 95% eradication of dog mustard. At 8 oz rates, control was: 2,4-D ester 95%, MCP sodium salt 70%, amine and ester 50%. In these plots, wild buckwheat, (Polygonum convolvulus), and lady's thumb, (Polygonum persicaria) were unaffected by MCP amine or ester, whereas growth was retarded by both rates of MCP sodium salt and 2,4-D ester. Cow cockle (Saponaria voccaria) survived in all plots. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada. Approval is not required to publish).

The use of 2,4-D and MCP compared in the control of Tartary buckwheat. Craig, H. A., Uhryniuk, W. T. and Fox, W. B. Early in July in northern Manitoba, sq rod plots of Tartary buckwheat (Fagopyrum tartasicum) were knapsack sprayed when the plants were in the 2-3 leaf stage, using 160 Imperial gal water/A with 8 and 16 oz/A of 2,4-D ester and amine and MCP ester, amine and sodium salt. Results: MCP sodium salt, especially at the higher rate, proved the most effective particularly in checking formation of seeds of buckwheat; the amines of both kinds were less effective than the esters. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada. Authority is not required to publish).

Effect of various herbicides on wild and cultivated oats. Ebell, L. F. and Corns, W. G. Rod length plots consisting of 4 rows of wild oats and 2 rows of cultivated oats (variety Victory) were sown May 31, 1954. NP at 10, 20, and 40 lb/A; CIPC at 5, 10, and 20 lb/A; and TCA at 12.5, 25, and 50 lb/A were applied two days after planting. Results: Analysis of green weight data taken at advanced flowering stage showed all treatments to be effective in reducing stand of both oat species; except the 10 and 20 lb rates of NP and the 12.5 lb rate of TCA on wild oats. The 40 lb rate of NP gave only a 20% reduction in stand of wild oats while CIPC and TCA gave reductions of about 20, 40, and 60% of check at the low, medium and high rates. Cultivated oats were much more severely injured than wild oats by NP and CIPC but less affected by TCA.

Endothal at 10, 20, and 40 lb/A; MH amine at 5, 10, and 20 lb/A; the sodium salt of alpha-alpha-dichloropropionic acid (Dalapon), all applied in 50 gal/A of water; DNBP at 2.5, 5, and 10 lb/A applied with 20 gal/A of diesel oil; and aromatic oil at 10, 20, and 40 gal/A were applied July 3. The wild oats were in the 3-4 leaf stage and 5-6 in tall, the cultivated oats somewhat more advanced. Results: Green weight data did not show significant reduction of wild oat stand by aromatic oil, or by the low rates of any chemical. The 5 and 10 lb rates of DNBP and diesel oil reduced the stand 85 and 90% respectively while the intermediate a nd high rates of MH and Dalapon reduced wild oat stand by over 95% and completely prevented heading. The cultivated oats were more tolerant to the contact herbicides, similar in reaction to Dalapon, and much more susceptible to MH as compared with wild oats. Differences in herbicidal response of the two species may have been due to differences in physiological age. The cultivated oat germinates more quickly, grows faster during the seedling stages but is overtaken by the wild oat as it approaches maturity. Such differences would have to be kept in mind in substituting the cultivated oat as a test plant in wild oat studies. (Contributed by the Department of Plant Science, University of Alberta, Edmonton, Alberta. Approved for publication).

Fall and spring application of soil sterilants to wild oat infested soil. Ubell, L. F. and Corns, W. G. TCA at 10, 20, and 40 lb/A; CIPC at 5, 10, and 20 lb/A; and SES at 25, 50, and 100 lb/A were applied October 1, 1953 and May 17, 1954. Sets of treatments were left undisturbed or were disked 1 day after spraying. Results: TCA at 20 and 40 lb/A stunted or killed wild oat seedlings in both spring and fall applications but with effect reduced by disking. Kill from CIPC, fall applied and disked into the soil, surpassed that from TCA while other CIPC treatments gave poor results. SES was ineffective against wild oats except at the 100 lb/A rate, fall applied and undisked, but gave good control of broadleaved weeds germinating early in the season. Later in the season escapes from chemical treatments tended to fill out the stand while much second growth occurred from severely stunted plants. CIPC treated wild oat plants exhibited a much weakened root system and were badly lodged following heavy rainstorms. (Contributed by the Department of Plant Science, University of Alberta, Edmonton, Alberta. Approved for publication).

Pre-emergence control of crabgrass. Elder, W. C. Different concentrations of CIPC, CMU, DNBP and 3-(3,4-dichlorophenyl)-1,1-dimethylurea in 40 gal water/A were sprayed on several crops immediately after planting at two different dates. Results: Excellent crabgrass control was secured from treatments made when the soil was moist and applied before a one inch rain. Results from the second test under dry conditions were not outstanding. Determinations made three weeks after crop emergence for the test under good moisture conditions show CIPC at rates of 3, 6, and 12 lb/A gave 67, 98, and 99% control. CMU at 1 and 2 lb/A gave 97 and 99% control. DNBP at 6 and 12 lb/A gave 93 and 95% control. 3-(3,4-dichlorophenyl)-1, 1-dimethylurea at 1, 2, and 3 lb/A gave 98, 100, and 100% control. Under good moisture conditions satisfactory control of crabgrass was obtained with pre-emergence sprays of 4 to 5 lb/A of CIPC, 6 to 8 lb/A of DNBP, and 1 lb/A each of CMU and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea. At these rates CIPC was less injurious to crops than the other herbicides used in the test. This is especially true of legume crops. 3-(3,4dichlorophenyl)-1, 1-dimethylurea appears to be less injurious than CMU to many crops and crabgrass control was superior. More than 1 lb/A of the urea compounds was severe on the crops involved. Where a satisfactory control of crabgrass was secured, a good stand of crops was obtained only from the large seeded types that could be planted more than 1/2 in deep. (Contribution of Agronomy Department, Oklahoma Agricultural Experiment Station).

The effect of herbicides on wild buckwheat. Forsberg, D. E. In 1954, amine and ester of 2,4-D, MCP butyl ester, low volatile esters (LV-4 and 10-10) were sprayed on wild buckwheat at 4, 8, and 12 oz acid equiv/A. Also included in the test were amino triazole at $\frac{1}{4}$, $\frac{1}{2}$, and 1 lb acid equiv/A and MH at 2 and 4 lb acid equiv/A. The buckwheat was mostly in the cotyledon stage. Results: The amino triazole and MH severely reduced the yields of wheat and did not kill the weed but severely stunted it for 1-2 weeks. The amino triazole caused chlorosis in both the buckwheat and the grain. However, by harvest time there was little difference between the buckwheat in these plots and check plots. The higher rates of 2,4-D, MCP, and the low volatile esters caused significant reductions in the yield of wheat and did not control buckwheat with the exception of 2,4-D and LV-4 at 12 oz/A. Both these treatments retarded the buckwheat so that it did not reach the advanced vining stage by harvest. The reaction of 10-10 was no different than equivalent rates of 2,4-D.

2,4-D ester at 4 oz acid equiv/A in combination with ammonium nitrate (33.5-0-0) at 30 lb/A and a liquid fertilizer 5-10-5 at 3½ gal/A, and LV-4 at 4 and 8 oz acid equiv/A in combination with liquid fertilizer 7-14-7 applied at 3½ gal/A, also LV-4 at 5 oz. acid equiv/A in combination with 7-14-7 at 3½ gal/A at 2 dates in 2-week intervals, were applied to buckwheat in the cotyledon stage. Results: The immediate results of the herbicide and nitrogen mixtures were very striking. However, 2 weeks after treatment the plants began to vine and flower. The LV-4 and nitrogen followed the same trend except that the plant kill was slightly higher. The 2 applications of LV-4 and nitrogen fertilizer were very striking. The buckwheat plants wilted after treatment, the branches were much thickened and the roots showed heavy lesions. After the 2nd application, much of the buckwheat was killed and remaining plants did not produce vines to interfere with harvest. The latter treatment was by far the best.

2,4-D ester and LV-4 at 3 oz acid equiv/A applied at 3 dates at weekly intervals and 2,4-D ester and LV-4 at 5 oz acid equiv/A at 2 dates applied at 2-week intervals were sprayed on buckwheat in the cotyledon stage. Results: All treatments were very striking in their control, with no significant difference between the yield of wheat on the treated plots and the check. In all plots the buckwheat was severely stunted for the remainder of the season. Higher kills were recorded in the LV-4 plots than in the 2,4-D plots. There was little or no difference between the 3 oz and the 5 oz applications of both chemicals. These two treatments have been the most promising treatments to date.

In a preliminary test, LV-4 was applied to buckwheat in the cotyledon stage, at 5 oz acid equiv/A, and also two 5 oz rates two weeks apart. Results: The two applications of LV-4 applied 2 weeks apart gave 64% kill while the one application gave 39% kill. The two applications of LV-4 appear to be a very promising treatment. (Contribution by the Dominion Experimental Station, Scott, Sask., 1954.) Approved for publication.

The effect of herbicides on wild oats. Forsberg, D. E. In June, 1953, CMU at 4, 5, and 10 lb/A, CIPC 4, 5, and 10 lb/A, TCA at 4 lb/A, Dalapon at 4 lb/A, IPC at 4 lb/A, and MH at 4 lb/A were applied as post-emergence sprays to an area sown to wild oats. Results: In 1954, the CMU at 4 and 5 lb/A gave 75% kill on wild oats and CMU at 10 lb/A gave 100% kill. CIPC at 4 and 5 lb/A gave 50% control of wild oats while the 10 lb gave a 100% control. All the other treatments showed no effect on the stand of wild oats in 1954. Also during 1954, these plots were left undisturbed. (Contribution by the Dominion Experimental Station, Scott, Sask., 1954. Approved for publication).

Effect of various herbicides applied three days after planting wild oats in the spring. Friesen, H. A. Wild oats seeded at 2 bushels per acre on May 25, 1954 were sprayed with the herbicides at the dosages given in the table below. The soil was not disturbed after spraying. Portions of each plot were sown to wheat, barley and flax ten days after treatment. Results: With the possible exceptions of barley on the Endothal at 12 lb/A and flax on the CMU at 10 lb/A, each of the treatments when used at a dosage sufficient to materially reduce the wild oat population so drastically reduced the stand of crop that its use would appear to be impractical.

	Herbicides	Active Ingred/A	Wild Oat Heads Sq. Yd.	% Stand of Barley	Wheat	Flax
1.	Endothal	4 lb	130	80	35	60
2.	"	8 lb	74	75	30	55
3.	"	12 lb	18	75	30	55
4.	IPC	5 lb	101	85	65	65
5.	"	10 lb	81	0	30	0
6.	"	15 lb	40	0	25	0
7.	Dalapon	5 lb	179	88	0	85
8.	"	10 lb	49	30	0	50
9.	"	15 lb	21	20	0	45
10.	TCA	20 lb	24	25	0	75
11.	"	40 lb	3	20	0	65
12.	CMU	5 lb	103	70	55	75
13.	"	10 lb	16	45	10	60
14.	"	20 lb	0	10	0	40
15.	Untreated	--	213	95	98	90

(Contributed by the Experimental Station, Lacombe, Alberta).

Cultural and fertilizer practices for the control of wild oats. Friesen, H. A. and Walker, D. R. An area seeded to wild oats on May 25, 1954 was subjected to the cultural and fertilizer practices given in the table below. Delayed seeding resulted in a very marked reduction in the number of wild oats but due to seasonal conditions it reduced rather than increased the yield of barley. The use of fertilizer in conjunction with delayed seeding did not appreciably influence the number of wild oats nor the yield of grain. Fertilizer in conjunction with normal seeding gave a slightly higher yield of barley and very markedly reduced the numbers of wild oats. Due to the exceptionally wet weather post seeding cultivation did not show to advantage.

	Date Sown	Fertilizer	Post-seed Cult.	Wild Oats per sq.yd	Yield bu/A
1.	June 17	None	rod-weed	20	28.2
2.	" 17	50 lb/A 11-48	"	21	28.0
3.	" 17	None	None	16	30.3
4.	" 17	50 lb/A 11-48	None	14	29.4
5.	May 28	None	rod-weed	80	37.2
6.	" 28	50 lb/A 11-48	"	44	38.9
7.	" 28	None	None	97	36.3
8.	" 28	50 lb/A 11-48	None	44	39.4

(Contributed by the Experimental Station, Lacombe, Alberta, Canada).

Effect of herbicides on Tartarian buckwheat in barley. Friesen, H. A. and Walker, D. R. 2,4-D butyl ester, MCP butyl ester, MCP potassium salt, MCP amine and propylene glycol butyl ether ester (1010) were each sprayed at 6 oz/A acid equiv in water solution on Tartarian buckwheat in the 6-8 leaf stage of growth. Results: None of the treatments killed the buckwheat but each resulted in very severe stunting. The plants recovered to some extent but just prior to maturity the treated plants were 8-10 in shorter than the untreated, had fewer branches and produced very little seed. 2,4-D butyl ester at 6 oz/A plus CMU at 2 oz/A and MCP butyl ester plus CMU at 2 oz/A were also included in this test. Each of these mixtures killed some 25% of the plants with the remainder severely stunted. Further growth or recovery of these treated plants was almost negligible. Unfortunately,

season conditions prevented the taking of grain yields. (Contributed by the Experimental Station, Lacombe, Alberta, Canada).

Effect of herbicides on hemp nettle (Galeopsis tetrahit) at three growth stages. Friesen, H. A. and Walker, D. R. MCP ester, amine and sodium salt, 2,4-D ester and amine, and butoxy ethanol ester (LV-4) were each applied at 2, 4, 6, and 8 oz/A acid equiv to hemp nettle in the 2-4 leaf stage of growth. Results: the 6 and 8 oz/A dosages of each MCP formulation resulted in a very marked suppression of growth; none of the treated plants attained a height of more than 6 in as compared with a seasonal growth of some 20 in of the untreated plants. The estimated kill of plants by each of the 6 and 8 oz/A rates was 45 and 60%, respectively. The ester formulation appeared to be slightly more effective than the amine and sodium salt. The other treatments did not result in satisfactory control.

The above formulations were applied at rates of 4 and 6 oz/A to hemp nettle in the 4-6 leaf growth stage. Results: Again, each of MCP formulations at 6 oz/A resulted in very satisfactory control but only some 35% of the plants were killed. The remaining treatments were unsatisfactory. The addition of a detergent "Orvus" did not enhance the effectiveness of any of the treatments. Mixing 2,4-D and MCP had no particular merit; the degree of control was entirely dependent on the dosage of MCP applied. Amino triazole at 4 and 8 oz/A active ingredient was also used in this trial and resulted in complete killing of the nettle as well as seedling stinkweed, ball mustard, and wild oats that infested the plot areas. Blue bur tended to show considerable tolerance to this herbicide.

The above treatments applied to hemp nettle in the early flower stage resulted in little or no control of this weed. The amino triazole at 4 oz/A caused chlorosis of all or part of the flower head but did not kill the plants. The 8 oz/A rate of triazole was not used at this growth stage. In this trial, the plot area was not sown to a crop. (Contributed by the Experimental Station, Lacombe, Alberta).

Effect of herbicides on lady's thumb (Polygonum persicaria). Friesen, H. A. and Walker, D. R. MCP butyl ester and 2,4-D butyl ester were each applied at 4, 6, 8, and 12 oz/A; MCP amine, 2,4-D amine and propylene glycol butyl ether ester (10-10) were each applied at 4 and 8 oz/A to lady's thumb growing in a field of Olli barley. The infestation of lady's thumb was quite uniform and extremely heavy. The weeds were in the 4-6 leaf stage and the barley was in the 4-leaf stage of growth at the time of spraying. All rates are in oz of acid equiv/A. Results: Propylene glycol butyl ether ester (10-10), 2,4-D ester and 2,4-D amine in that order resulted in the most satisfactory control. The differences in favor of the 10-10 over the 2,4-D ester or the 2,4-D amine were not great. The high rate of the 10-10 resulted in a visible stunting of the barley and caused many plant deformities. None of the MCP treatments gave satisfactory control of the lady's thumb. Barley yields were not obtainable. (Contributed by the Experimental Station, Lacombe, Alberta).

Effect of herbicides on corn spurrey. Friesen, H. A. and Walker, D. R. 2,4-D butyl ester; MCP butyl ester, potassium salt and amine; and propylene glycol butyl ether ester were each sprayed at 6 oz/A on corn spurrey Spergula arvensis in barley. The spurrey was in the flower stage at the time of treatment. Two mixtures, viz: 1) 2,4-D butyl ester at 6 oz/A plus CMU at 2 oz/A and 2) MCP butyl ester plus CMU at 2 oz/A were also included in the test. None of the treatments had any visible effect on the corn spurrey at this stage of growth. (Contributed by the Experimental Station, Lacombe, Alberta).

Control of weeds on irrigation canals at three locations. Furrer, J. D. and Sand, P. F. Duplicate plots on field laterals at two locations were treated June 8, 1954 with CMU at 5 and 10 lb/A, 3-(3,4-dichlorophenyl)-1-1-dimethyl urea (Telvar DW) at 5 and 10 lb/A and PCP at 2 and 4 qt/A in 10 gal of oil. On June 11, an irrigation ditch was treated with the same chemicals but the PCP was applied in 40 gal of oil. Additional treatments of 6 and 12 lb/A rates of Dalapon were applied. 1 lb of 2,4-D amine was applied with all of the treatments except PCP. The laterals had a 2-6 in growth of foxtail. Barnyard grass, lambsquarters, kochia and sunflower were 1-2 ft tall. The ditch had mature dock, sweet clover in the blossom stage, some sedge 12-16 in tall, ragweed 1-2 ft tall, and muhlenbergia 6-8 in tall. Notes were taken July 20 on the ditch and July 30 on the laterals.

Results: PCP did not give satisfactory control of weeds in any of the three locations. 10 lb/A of CMU and Telvar DW in combination with 2,4-D gave approximately 95% control of grass and broadleaf weed. The 5 lb rates of these chemicals gave approximately 85% control. Muhlenbergia was stunted with both rates of CMU and Telvar DW while ground cherry, milkweed and wild lettuce survived. Dalapon and 2,4-D in combination gave good control of grasses and broadleaf weeds at both rates. The sedge was stunted and turning brown at the 12 lb rate. Alfalfa, milkweed, and goldenrod survived treatment. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska. Approval for publication not needed).

The use of Dalapon and 2, 4-D for maintaining summer-fallow land in weed-free condition. Phillips, W. M. Dalapon at 3 and 5 lb/A and combinations of Dalapon at 3 and 5 lb/A plus ½ lb 2,4-D/A were applied by airplane on August 17, 1954 for the control of annual weedy grasses and broadleaved weeds on summer-fallow land to be planted to wheat in September, 1954.

Results: The plots receiving 2,4-D had excellent control of broadleaved weeds. 3 lb of Dalapon applied in 4 gal of water/A gave some stunting of grass but not satisfactory control. The 5 lb application was only slightly better than the 3 lb rate when applied in 4 gal of water. Dalapon at 5 lb/A applied in 8 gal of water severely stunted the grass and killed some of the small plants but many of the plants were alive 3 weeks after treatment. Applications made the same date with a ground sprayer at corresponding rates gave similar results with the 3 lb rate not being satisfactory. At the time of treatment, the weather was warm and ½ inch of rain had fallen on the plot area the previous night. Following application, the area received approximately 2 in of rain in a 7-day period. The principal weedy grass species treated was stinkgrass (Eragrostis cilianensis). (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas). Approved by Field Crops Res. Br. USDA.

Control of downy brome (Bromus tectorum) and hairy chess (Bromus comutatus). Sand, P. F. and McCarty, M.K. Triplicate 5' x 18' plots of a mixed stand of downy brome and hairy chess were treated April 17, 1954 with CMU at 1, 2, 3, and 4 lb/A, phenyldimethyl urea at 1, 2, 3, and 4 lb/A, 3-(3,4-dichlorophenyl)-1, 1-dimethyl urea at 1, 2, 3, and 4 lb/A, CIPC at 5, 10, and 15 lb/A, boron chlorate mixture at 45 and 75 lb/A active ingredient and 2, 2-dichloropropionic acid at 2, 4, and 6 lb/A. The weedy bromes were about 2-2½ in tall at the time of treatment. Percent control was estimated May 27, 1954. Results: The chemicals that gave satisfactory control were CMU at 3 and 4 lb/A which gave 82 and 95% control and 2,2-dichloropropionic acid at 2, 4, and 6 lb/A which gave 86, 100, and 100% control respectively. Phenyldimethyl urea gave 78% control at 4 lb/A. All other chemicals gave 60% or less control. (Contribution of Department of Agronomy, College of Agriculture and Section of Weed Investigations A.R.S. and the Nebraska Agricultural Experiment Station Cooperating). Abstract does not require specific approval of Experiment Station Director.

Effect of fall application of IPC (dust vs. spray form) in destroying wild oat seeds on the soil surface. Shebeski, L. H. and Burrows, V. D. On October 17, 1953, wild oat seeds were broadcast over 3 areas (16' x 200' each) on the University Farm. These 3 strips then received the following treatments: IPC dust at 10 lb/A, IPC liquid at 10 lb/A, and untreated check. After treatment, the seeds and chemical were worked into the soil with a double disc to a depth of 1½-2½ in. Virtually no wild oats emerged in the fall. In the spring of 1954, the land was first harrowed and then the following crops seeded at right angles to the chemical treatments: sunflowers, rape, brome, flax, soybeans, sugar beets, peas, alfalfa, oats, wheat and barley on May 18, corn was seeded on May 26, and a delayed seeding of wheat, oats, and barley on June 18. Results on wild oat emergence in the spring were as follows: In the check plots and the one receiving the dust form of IPC, a very heavy stand of wild oats resulted, the stand being so heavy that the crop plants were almost eliminated from these plots. The liquid form of IPC gave virtually complete control of wild oats, only a few scattered plants emerged. Crop tolerance to the residual effect of liquid IPC varied: corn, sunflowers, rape, soybeans, sugar beets, peas, and alfalfa were completely resistant and produced a normal weed-free crop. Flax showed some damage at early growth stages. Oats, barley, wheat, and brome sown on May 18 were almost completely eliminated by the residual IPC. The delayed seeding (June 18) produced a normal stand of wheat, oats, and barley. Apparently the residual effect of IPC had disappeared by this time. The following table gives the yields of some of the crops in this experiment. (The cereal crops are not included because of serious rust infestation and lodging).

	Type of Crop and Crop Yields						
Treatment	Sugar Beets tons/A	Alfalfa (fresh wt) Tons/A	Sunflowers (total pl) tons/A	Corn (total pl) tons/A	Rape lb/A	Soy beans bu/A	Flax bu/A
Weedy check	.46	.34	2.12	.28	48	2.42	.43
Weed-free check	13.96	3.80	15.50	6.40	968	23.40	13.82
Liquid IPC 10 lb/A	12.12	4.53	18.34	6.05	1210	24.20	7.35

(Contributed by Division of Plant Science, The University of Manitoba. Approved for Publication).

Effect of several herbicides on wild buckwheat (Polygonum convolvulus). Shebeski, L. S. and Burrows, D. D. Fifty-foot rows of wild buckwheat were seeded in a weed nursery on April 15, 1954. On July 18 individual 3' strips were treated with 13 different herbicides. The wild buckwheat was then 6-7" tall and beginning to creep. The herbicides tested were 2,4-D (amine salt, amine salt "British product", ethyl ester, and butoxy ethanol ester); MCP (sodium salt, sodium salt "British product", amine salt, and butyl ester); DPA (3,4-dichlorophenoxyacetic acid); Amizol (amino triazole); Dalapon 2-2dichloropropionic acid); Denocate (dinitro-ortho-cresol); and Sevtox (ammonium salt of dinitro-ortho-sec-butyl-phenol). The phenoxy type compounds were applied at 2, 4, and 8 oz/A; Dalapon and Amizol at 3, 5, and 10 lb/A; and the dinitro phenols at 4½ lb/A. Results: Excellent control of wild buckwheat was obtained with the following treatments: Amizol at 5 and 10 lb/A, Sodium salt of MCP (both products) at 4 and 8 oz/A, 2,4-D amine (both products) at 8 oz/A, butoxy ethanol ester of 2,4-D at 8 oz/A, and Denocate at the 4½ lb/A rate. Considerable reduction in plant vigor was obtained with Dalapon at 10 lb/A, 2,4-D ethyl ester at 8 oz/A, and 2,4-D amine at 2 and 4 oz/A. Other rates and formulations gave poor or no control. (Contribution from the Division of Plant Science, The University of Manitoba).

The period of toxicity of IPC and CIPC when applied to the soil at various times of the year. Wiese, A. F. and Dunham, R. S. During 1951 and 1952, two experiments were conducted on Waukegan silt loam soil to determine how long IPC and CIPC would persist in the soil in quantities large enough to be toxic to oats. Applications of IPC and CIPC were made at 5, 10, and 15 lb/A on Aug 21, Sept 11 and Sept 28, 1951. In 1952, the chemicals were applied at 8 lb/A on the first of each month from May to October. Each treatment was replicated three times and the plot size was either 12 by 18 or 11 by 15 ft. The period of toxicity was determined by sowing 3 rows of oats across each plot twice a month during the growing season until normal growth was attained. Oats were sown on May 1 to determine if the chemicals persisted over winter.

Results: In all cases, CIPC remained toxic to oats longer than did IPC. The 3 rates of IPC that were applied on Aug 28, 1951, did not persist in the soil over winter, but the 10 and 15 lb rates of CIPC did. Only the 15 lb rate of IPC and all 3 rates of CIPC persisted over winter from the Sept 11 application. All rates of both herbicides persisted over winter when applied on Sept 28, 1951. None of the IPC treatments applied in the fall remained toxic after May 15, but the 15 lb rates of CIPC were effective until July 1. The 8 lb rates of IPC applied in May, June, July, August, and September, 1952, persisted 1.5, 1.0, 0.5, 1, and 2.5 months respectively; and the 8 lb rate of IPC applied in October 1952 persisted until the following May. Applications of CIPC made during May, June, July, and August, 1952, persisted 2.0, 1.0, 1.0, and 3.5 months respectively, and both the September and October applications were toxic to oats the following May. In general, the herbicides were inactivated most rapidly when applied during the hot months except for August, 1952; but the soil was very dry that fall, which probably impeded the action of microorganisms that ordinarily destroy these chemicals. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3273, Sci. Jour. Series, Minn. Agric. Exp. Station). Approved.

The effectiveness of CIPC and IPC when applied to crops and wild oats at different stages of growth. Wiese, A. F. and Dunham, R. S. During 1951 and 1952, two experiments were conducted on Waukegan silt loam soil to determine the phytotoxicity of CIPC and two formulations of IPC to wild oats and crops when applied at different dates. To determine how the chemicals would respond when applied prior to sowing the crop, emulsifiable formulations of IPC and of CIPC and a wettable powder of IPC were applied to the soil at 0, 5, 8, 10, and 15 lb/A. Immediately afterwards, they were mixed into the soil by tandem disking the area 3 times, wild oats were sown over the whole area, and then cultivated oats, barley, wheat, and flax were sown at 90, 64, 96, 90, and 40 lb/A, respectively, on separate plots. The experimental design was a split-split plot with 3 replications, and the plot size was 6 x 8 ft.

Results: All 3 formulations at all rates nearly eliminated the crops and wild oats; flax appeared to be somewhat more tolerant to the treatments than the small grains and wild oats. All 3 herbicides reduced the stands of each crop comparably, indicating that in this trial the chemicals had the same phytotoxicity.

In order to determine the phytotoxicity of the 3 herbicides when used post emergence, they were applied to Redwing flax, 1, 4, and 11 in tall on land previously sown to wild oats. The emulsifiable formulations of IPC and CIPC were applied at 3 lb/A and the powdered IPC at 6 lb/A. The plot size was 6 x 8 ft. and the treatments were replicated three times. The wild oats did not germinate so that the effectiveness of the treatments on the weed was not determined but seed yield, straw yield, and date of full bloom were determined on the flax.

Results: Injury was greatest at the 11 in stage (the period of flower initiation) when all 3 formulations significantly reduced yield. At the 1 and 4 in stages, only CIPC reduced the yield significantly. Yields of seed on these plots were 6.3, 10.1, and 2.6 bu/A when sprayed at the 1, 4, and 11 in stages while the check yielded 21.4 bu. The yield of flax treated at the 11 in stage with powdered IPC and IPC was8.4 and 9.8 bu/A respectively. CIPC also significantly reduced straw yield at all stages and delayed the maturity most. At the 11 in stage, IPC and powdered IPC delayed full bloom 9 days but CIPC delayed it 14 days. The delayed blooming was caused by severe injury to the growing point. After the chemical treatments, new growth had to be reinitiated from branches several nodes below the top of the plant. These two studies showed that IPC and CIPC had the same toxicity to flax, wheat, and wild oats when applied to the soil, but when applied as a post emergence treatment to flax, CIPC was much more toxic than IPC. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3272 Sci. Jour. Series, Minn. Agric. Exp. Station). Approved.

The effect of fall application to the soil of TCA, CIPC and Endothal for the control of wild oats. Wood, H. E., Vodrey, F. C. and McKenzie, J. D. A field 10 miles east of Winnipeg on heavy clay loam and known to be very heavily infested with wild oats, (Avena fatua L.) was selected for appraising the value of TCA, CIPC and Endothal at various rates applied in 19 Imperial gal water/A by machine spraying October 15, 1953. The soil was quite dry at time of application but heavy rains fell prior to freeze-up in mid-November. Each plot was15 x 150 ft, alternated by a check plot similar in size. Following application, plots were treated as follows: 1/3 of the plot areas were disced cross-wise to a depth of 4 in, 1/3 to a depth of 1½-2 in, the balance left uncultivated. Prior to application of chemical, the field had been one-wayed and harrowed. In May of 1954, each of the three sections was cross-seeded with one width of a grain drill to each, wheat, barley, and flax to determine residual effect.

Results: Endothal at 7½, 15, and 22½ lb/A gave only a limited measure of control of wild oats. CIPC at 15 and 30 lb/A gave approximately 95% control where disced to a depth of 2 in but at 4 in and with no cultivation, only 50%. TCA at 15, 30, 45, and 60 lb/A gave a greater measure of control, even at the low rate. An observation made on the 3rd inspection June 4, when many wild oats appeared to be emerging showed these to be from seeds 3-6 in below the surface; rootlets of such plants were meager and deformed as were the emerging shoots. A later inspection failed to find any of this growth surviving. Flax failed to emerge on the Endothal plots, some 60% on the CIPC plots, while emergence and development was normal on all TCA plots. Wheat and barley failed to germinate to any extent on any plots. (Contribution of the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Authority to publish not required.

Effect of various herbicides in the control of wild oats in peas and flax. Wood, H. E. and Fox, W. B. In the Portage la Prairie district, some 60 miles west of Winnipeg, on heavy clay loam in two fields of peas and one of flax infested with wild oats (Avena fatua L.) plots were post-emergent knapsack sprayed June 24. The wild oats were 4- 10 in high, the peas 4-5 in, the flax 6-7 in. Some wild mustard and green foxtail was also present. CMU (Karmex W, Karmex FW, Karmex DW) were applied at 1 and 2 lb/A; TCA at 2½ and 5 lb/A; Dalapon 1¼, 2½ and 5 lb/A. Results: The CMU products gave limited wild oat control at the higher rate but proved very damaging to the crop. TCA, while destroying the green foxtail, gave little or no wild oat control (due probably to advanced stage of its growth at time of application); it had no adverse effect on either peas or flax. Dalapon gave progressively better wild oat control with increased dosage (only at one location did control at 5 lb approach 100%). Damage to the crop was severe at 5 lb (at 1¼ lb

no crop damage, but quite limited wild oat control). (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approval is not required to publish.

Effect of Dalapon on wild oats. Wood, H. E. and Fox, W. B. In the Portage la Prairie district some 60 miles west of Winnipeg, plots heavily infested with wild oats (Avena fatua L.) were knapsack sprayed when the oats were 2½-3 in high; in one field, field peas had been planted and were just emerging; no crop had been planted at the other location. Dalapon was applied at 3, 6, and 9 lb/A. Results: Dalapon retarded the growth rather than killing the wild oats. Only slight control was obtained at 3 lb, a very considerable measure at 6 lb, with almost complete control at 9 lb. The peas were somewhat delayed at 9 lb but otherwise were a better crop than in the untreated portion of the field. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approval is not required to publish.

Effects of various herbicides applied pre-emergence for the control of wild oats in field peas. Wood, H. E. and Fox, W. B. In the Portage la Prairie district, some 60 miles west of Winnipeg, on heavy clay loam at three locations, various herbicides were knapsack applied May 10, previous to planting, to soil known to contain wild oats (Avena fatua L.) In all cases, even though the soil was unduly wet, the land following application was disced to a depth of 3-4 in. Applications were made to plots 10 ft sq as follows: IPC 4, 6, and 8 lb/A; CMU (Karmex W, Karmex DW and Karmex FW) 1 and 2 lb/A; and a boron-CMU product (Nalco H-174) 6 lb/A. Peas were planted soon after application. Results: Nalco H-174 acted as a soil sterilant killing all growth; the CMU products gave insufficient wild oat control and destroyed most or all peas; IPC at 6 and 8 lb gave rather inconsistent, although promising control, with slight to no damage to peas (4 lb was apparently insufficient to give more than about 50% wild oat control). Inconsistent results in part may have been due to the very wet soil that made complete and uniform incorporation of the herbicide difficult. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approval is not required to publish.

Effect of various herbicides on hemp nettle. Wood, H. E. and Fox, W. B. Near Whitemouth, 60 miles east of Winnipeg, in a field of durum wheat quite heavily infested with hemp nettle (Galeopsis tetrahit L.) sq rod plots were knapsack sprayed as follows: June 3 when the nettle was emerging to 4- leaf (occasional to 6-leaf), wheat 2½ to 4 in high with MCP ester, amine and sodium salt and 2,4-D ester at 8 and 16 oz/A; amino triazole 2½ and 5 lb/A. June 14 when nettle plants were in the 2-8 leaf and wheat 6-8 in tall, a similar series was treated except that amino triazole and 2,4-D at 8 oz/A were omitted. Results: Triazole proved too severe, killing all growth (except trace of nettle at 2½ lb); 2,4-D at 8 oz was ineffective, while at 16 oz it gave a good measure of control. All MCP formulations, even at 8 oz/A gave promising control. Early treatment proved decidedly advantageous. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approval is not required to publish.

Spring Sown Grains

Summary

W. J. Breakey

Fifteen abstracts were received for entry in this section. An additional 4 abstracts reporting results in spraying weeds when applied by air and ground and two reporting effect of fall applications of herbicides on destroying wild oats seeds on the soil surface. The latter 6 will be reported under their proper headings. From the fifteen abstracts submitted the following general conclusions are drawn:

Wheat

Pavlychenko and Bestrop using a variety of herbicides found all beneficial excepting Amizol, which proved injurious to wheat and barley even at the 2 oz./A.

Oats and Barley

Several abstractors found this crop more tolerant to M.C.P. than 2,4-D when applied at comparable rates. Likewise, oats, under treatment with MH for wild oat control in the pre-heading stage, proved more susceptible than did wild oats. Pavlychenko and Bestrop in trials using a number of different herbicides found oats much less tolerant as the growth stage increased, causing delay in maturity and yield reduction. Carder found that the germinability of the wild oat kernel could be reduced to under 1% by the application in a spray of as little as one-half pound per acre of the active ingredient of MH. Thus it was found possible to destroy the germinability of wild oats without reducing either the yield or germinability of barley. Carder also found that the phasic development of Olli barley was sufficiently different from that of wild oats to permit a high degree of selection.

General

Brown and Sexsmith reported delayed seeding for wild oat control from 3 to 4 weeks, while reducing the wild oat population, proved not profitable when grain yield returns were considered.

Abstracts

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on wheat. Pavlychenko T.K. and Bestrop, A.J. Large size plots of wheat (Triticum vulgare) were treated when 6 inches high (at the expansion of the fourth leaf) with low volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 3, 5, 8 and 10 oz/A) and 2,4-D (Weedone LV4 at 2½, 4 and 7 oz/A), amine salt of MCP (Weedar MCP at 4, 6 and 10 oz/A), ethyl ester of 2,4-D (Weedone Concentrate at 3, 5 and 8 oz/A) and 3, amino 1,2,4-triazole (Amizol at 2,4, 6, 8 and 10 oz/A). The crop was infested with Russian pigweed (Axyris amaranthoides), Russian thistle (Salsola kali) and wild buckwheat (Polygonum convolvulus). Moisture supply was very abundant during the growing season, and the crop suffered severe damage from rust and sawfly. RESULTS: All chemicals and rates gave a very effective kill to more sensitive weeds and wild buckwheat was well controlled, especially by the higher rates of Weedone LV4 and Weedone Concentrate. All the chemicals used were beneficial to the crop, excepting Amizol, which proved injurious to wheat even at 2 oz/A and destroyed it at 8 and 10 oz/A. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Comparative Effect of 2,4-D and MCP on Oats 1954. Brown, D. A. Experiment A. The variety Exeter was treated at two stages of growth i.e. 4 and 8 inches in height with 2,4-D and MCP standard esters, amines and sodium salts. Esters were applied at 2 and 4 oz./ac., amines at 3 and 5 and sodium salts at 4 and 6 oz./ac. Results: The only treatments that significantly reduced yield were those of 2,4-D ester at both rates when the plants were 8 inches high. Yields were lowered by the same treatment at the 4 inch height but not significantly. Experiment B. Treatments applied to Rodney oats when plants were 8 inches high included two low-volatile 2,4-D esters, one low-volatile MCP ester and one standard MCP ester. All were applied at uniform rates of 3 and 6 oz./ac. The two 2,4-D esters seriously injured the crop. At the 3 oz./ac. rate average yields were 38.2 and at the 6 oz. rate 30.3 bu./ac. Low-volatile MCP yielded 64.7 and 62.9 bu./ac. and the standard ester of MCP 62.0 and 62.7 respectively for the 3 and 6 oz. rates. Check plots averaged 62.9 bu./ac. MCP did no obvious harm to the crop. (Contributed by Experimental Farm, Brandon, Manitoba.)

Comparison of 2,4-D and MCP for control of Weeds in Oats 1954. Brown, D. A. Esters at 2 and 4 oz/ac.; amines at 3 and 5, and sodium salts at 4 and 6 oz/ac. of 2,4-D and MCP were applied to a crop of Exeter oats at two dates i.e. when weeds were breaking into the true leaf stage and one week later when they were in the advanced seedling stage. The oats plants on the respective dates were 5 and 8 inches in height. Weeds prevalent were:- stinkweed, lambs quarters, red root pigweed, grey tansy mustard, pepper grass, common night shade, wild buckwheat, portulaca and golden corydalis. Results: In general the second date of spraying gave distinctly better results than the first. Fresh germination of seeds after the first treatment was apparent and at the second date killing of a heavier population of weeds left the plots much cleaner than those treated one week earlier. Ester of 2,4-D at the 4 oz. rate gave the highest percentage weed kill, but it was the only treatment that measurably injured the oats. MCP ester at 4 oz/ac. gave excellent kills of all weeds except buckwheat and portulaca. Amines of both 2,4-D and MCP required the 5 oz. rate to control red root pigweed, but they merely set back growth of buckwheat and portulaca. Sodium salts at the 6 oz. rate gave results closely approaching those of the amines at the 5 oz. rate. Weighted ratings of the chemicals, formulations and rates, in per cent of total weed kill were:- 2,4-D ester 4 oz. 83; MCP ester 4 oz. 81; 2,4-D amine 5 oz. 80; MCP amine 5 oz. 78; MCP sodium salt 6 oz. 78; 2,4-D sodium salt 6 oz. 76; 2,4-D ester and MCP ester 2 oz. 75; 2,4-D amine 3 oz. 72; MCP amine 3 oz. 70; MCP sodium salt 4 oz. 70; 2,4-D sodium salt 67. (Contributed by Experimental Farm, Brandon, Manitoba.)

The selective control of Wild Oats in cereal crops by use of maleic hydrazide. Carder, A. C. This experiment was conducted in 1953 but results were not available until 1954 due to the large number of germination trials involved. MH at rates of 1/2, 1 and 1/2 lb/A was applied in a water spray at the rate of 5 gal/A. Eleven treatments at intervals of 2 or 3 days were made. Treatments were commenced when the wild oats were in late shot blade and were continued until the wild oats were in late milk. Four cultivated cereals selected for earliness and popularity were investigated. The results of the experiment are summarized as follows: 1) At a certain growth stage, i.e., in the milk, the germinability of the wild oat kernel can be reduced to under 1% by application of as little as 1/2 lb/A active ingredient of MH. 2) The germinability of the cereals under test: Olli barley, Redwing flax, Saunders wheat, Larain oats, was also seriously impaired when MH was applied when they were in the milk. 3) The phasic development of Olli barley was sufficiently different from that of wild oats, however, to permit a high degree of selection, i.e., treatment could be made when the germinability of the wild oats was destroyed, while that of Olli barley was

not affected. 4) The same situation existed for Redwing flax but to a lesser degree, i.e., the germinability of flax was reduced slightly. The period during which high selectivity could be made was very short. 5) The phasic development of Saunders wheat and Larain oats did not permit selectivity insofar as germinability was concerned. Moreover, these two cereals did not seem to have as high a tolerance towards MH as did the barley and flax and this fact may contribute to the lower degree of selectivity between them and wild oats. 6) The yield of barley was not reduced by the chemical by any treatment; the yields of the other cereals were, but only when treatment was made at certain of their growth stages. Because of this it was possible to destroy the germinability of wild oats and (a) not lower the yield or the germinability of Olli barley, (b) not lower the yield but slightly impair the germinability of Redwing flax, (c) not lower the yield but destroy the germinability of Saunders wheat and Larain oats. 7) The yield of wild oats was not affected by any treatment even though under some their germinability was virtually destroyed. (Contribution of Experimental Station, Beaverlodge, Alberta.)

Effect of various herbicides on wild and cultivated oats. Ebell, L. F. and W. G. Corns. Rod length plots consisting of 4 rows of wild oats and 2 rows of cultivated oats (variety Victory) were sown May 31, 1954. NP at 10, 20 and 40 lb/A; CIPC at 5, 10, and 20 lb/A; and TCA at 12.5, 25, and 50 lb/A were applied two days after planting. Analysis of green weight data taken at advanced flowering stage showed all treatments to be effective in reducing stand of both oat species; except the 10 and 20 lb. rates of NP and the 12.5 lb. rate of TCA on wild oats. The 40 lb. rate of NP gave only a 20% reduction in stand of wild oats while CIPC and TCA gave reductions of about 20, 40 and 60% of check at the low, medium and high rates. Cultivated oats were much more severely injured than wild oats by NP and CIPC but less affected by TCA.

Endothal at 10, 20, and 40 lb/A; MH amine at 5, 10, and 20 lb/A; the sodium salt of alpha-alpha-dichloropropionic acid (Dalapon), all applied in 50 gal A of water; DNBP at 2.5, 5, and 10 lb/A applied with 20 gal/A of diesel oil; and aromatic oil at 10, 20, and 40 gal/A were applied July 3. The wild oats were in the 3-4 leaf stage and 5-6 inches tall, the cultivated oats somewhat more advanced Green weight data did not show significant reduction of wild oat stand by aromatic oil, or by the low rates of any chemical. The 5 and 10 lb. rates of DNBP and diesel oil reduced the stand 85 and 90% respectively while the intermediate and high rates of MH and Dalapon reduced wild oat stand by over 95% and completely prevented heading. The cultivated oats were more tolerant to the contact herbicides, similar in reaction to Dalapon, and much more susceptible to MH as compared with wild oats. Differences in herbicidal response of the two species may have been due to differences in physiological age. The cultivated oat germinates more quickly, grows faster during the seedling stages but is overtaken by the wild oat in regards to maturity. Such differences would have to be kept in mind in substituting the cultivated oat as a test plant in wild oat studies. (Contributed by the Department of Plant Science, University of Alberta, Edmonton Alberta.)

2,4-D vs. MCP for the Control of Annual Weeds in Oats. Friesen, H. A. and D. R. Walker. MCP butyl ester, amine and sodium salt, 2,4-D butyl ester, low volatile propylene glycol ether ester and alkanolamine amine each at 4 and 8 oz./A were sprayed at two growth stages on annual weeds in oats. At the first date of spraying the weeds were seedlings, 2 to 3 inches tall; the second spraying was made when the Thlaspi arvense was beginning to bud. The major weed species present were stinkweed Thlaspi arvense and hemp nettle Galeopsis tetrahit with ball mustard Neslia paniculata, lamb's quarters Chenopodium album and Russian pigweed Axyris amerantoides present in limited numbers. Visual estimates, point sampling, plant

counts and dry weights were used to assess the weed population present and the degree of control obtained. Results: Each treatment resulted in excellent control of Thlaspi, Neslia, Chenopodium and Axyris at each of the two spraying dates. Galeopsis proved highly tolerant to all dosages of 2,4-D ester, amine and low volatile ester. The MCP formulations, while they killed only a very few Galleopsis plants, very effectively checked their further growth. At date 1 the average dry weight of this species was 13 gms/sq.yd. while on the 2,4-D and low volatile treatments it was 120 gms/sq.yd. At date 2 the MCP treatments were slightly less effective on Galeopsis. Because Thlaspi formed a large part of the weed population and was effectively controlled by each treatment the yield results did not correlate too closely with the degree control of Galeopsis obtained. Nevertheless, the yields were generally higher on the MCP treated plots than on those treated with the 2,4-D amine and considerably higher than on those treated with 2,4-D ester and low volatile ester. The latter two formulations caused a very high degree of plant deformities when applied at date 1. (Contributed by the Experimental Station, Lacombe, Alberta.)

The Reaction of Oats to 2,4-D and MCP applied at 20 Stages of Growth. Friesen, H. A. and D. R. Walker. 2,4-D butyl ester at $\frac{1}{4}$ lb./A, 2,4-D alkanolamine at $\frac{1}{2}$ lb/A, MCP butyl ester at $\frac{1}{4}$ lb./A and MCP triethanolamine at $\frac{1}{2}$ lb./A were sprayed at 3 day intervals on plots of Exeter oats. The first treatment was made at full emergence and the last after the kernels had begun to fill. Results: None of the treatments resulted in severe malformations of the leaves and stems; this may have been largely due to the very slow growth which resulted from the cool, extremely wet weather throughout most of the growing season. Results: Suppression of growth vigor, basal spread or lodging and floret sterility were the main effects observed. The 2,4-D amine at $\frac{1}{2}$ lb/A tended to result in generally lower yields than any of the other treatments. Yield depression was greatest just prior to and at the time of node formation dates 4, 7 and 8 and again at flowering times dates 13 and 14. The 2,4-D ester at $\frac{1}{4}$ lb./A resulted in marked yield depressions at dates 2, 7 and 8 as well as at date 14, or flower stage. The oats tended to be more tolerant to MCP than 2,4-D. However, MCP amine at $\frac{1}{2}$ lb/A depressed the yield at dates 8 and 13 and 16 to the same extent as 2,4-D ester at $\frac{1}{4}$ lb/A. MCP ester at $\frac{1}{4}$ lb/A depressed the yield at dates 2, 15, 19 and 20. Basal lodging and delayed maturity were decidedly less apparent where the MCP treatments were used. The occurrence of frost just before the plots were fully ripe has possibly resulted in some distortion of the yield. (Contributed by the Experimental Station, Lacombe, Alberta.)

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on Oats, Series 2. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of oats (Avena sativa) were treated when 7 to 8 inches high with low volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 2, 4, 6 and 8 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 5 oz/A) amine salt of MCP (Weedar MCP at 4, 6 and 10 oz/A), ethyl ester of 2,4-D (Weedone Concentrate at 2, 4 and 6 oz/A) and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). The crop was heavily infested with Russian pigweed (Axyris amaranthoides), Russian thistle (Salsola kali) and wild buckwheat (Polygonum convolulus). The soil was clay loam and growing conditions were very favorable due to abundant moisture. Special attention was paid to the new compound Amizol. RESULTS: All chemicals and rates gave effective reductions in the dry weight of weeds ranging from 98% with 5 oz/A of Weedone LV4 to 82% with 8 oz/A of Amizol. At this stage of treatment the oat crop was quite tolerant to all but the highest rates of Weedone Concentrate, Weedone LV4 and Amizol. The lower rates of these three chemicals gave crop yield increases ranging from 18% with 2 oz/A of Weedone Concentrate to 10% with 8 oz/A of Amizol. The highest rate caused reduction in vigor, 3 to 4 days delay in maturity and yield reductions up to 8%. Weedar MCP

and ACP-L-601 were the most tolerant. Yield increases ranged from 25% with 4 oz/A of Weedar MCP to 10% with 8 oz/A of ACP-L-601. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Data

Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.	Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.
Check		56.4			Check		59.1		
WC	2	66.8	18.4	98.3	Amizol	4	66.2	12.8	88.8
LV4	2	62.8	11.3	98.9	WC	6	48.6	-8.2	96.9
MCP	4	70.4	24.8	98.6	LV4	5	51.9	-8.7	97.5
Check		58.8			Check		60.1		
ACP-L-601	2	70.6	20.0	92.6	MCP	10	63.7	10.5	94.4
Amizol	2	67.4	14.6	89.7	ACP-L-601	6	65.9	10.9	87.9
WC	4	60.9	3.7	93.9	Amizol	6	66.1	10.9	89.2
Check		53.1			Check		61.9		
LV4	3	61.8	16.3	98.4	ACP-L-601	8	62.6	10.1	89.2
MCP	6	67.1	26.3	89.3	Amizol	8	63.2	10.2	82.0
ACP-L-601	4	65.1	22.5	96.1	Amizol	10	49.8	-8.0	89.2

Note: WC - ethyl ester of 2,4-D; LV4 - butoxy ethanol ester of 2,4-D; MCP - amine salt of MCP; ACP - L-601 - butoxy ethanol ester of 3,4-D; Amizol - 3, amino 1,2,4-triazole.

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on Oats, Series 3. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of oats (Avena sativa) were treated when 15 inches high (just prior to shot-blade) with low volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 2, 4, 6 and 8 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 5 oz/A, ethyl ester of 2,4-D (Weedone Concentrate at 2, 4 and 6 oz/A) and 3, amino 1,2,4-triazole (Amizol at 2,4, 6, 8 and 10 oz/A). The crop was infested with Russian pigweed (Axyris amaranthoides), Russian thistle (Salsola kali) and wild buckwheat (Polygonum convolvulus). The soil was clay loam and moisture supply was very abundant during most of the growing season Special attention was paid to the new chemical Amizol. RESULTS: All chemicals and rates were quite effective in controlling the majority of the weeds, with the 2,4-D formulations being the most effective, followed by Weedar MCP, ACP-L-601 and Amizol. Per cent reduction in the dry weight of weeds ranged from 99% with 5 oz/A of Weedone LV4 to 25% with 2 oz/A of Amizol. At this stage of treatment the oat crop was not tolerant to any of the chemicals and rates used. Delays in the maturity date of the grain were caused by all treatments, ranging from 1 to 3 days. Blasting of florets occurred with all treatments, ranging from very slight (approximately 2%) with the lowest rate of ACP-L-601, Weedar MCP and Amizol to numerous (approximately 10%) with the highest rates of Weedone Concentrate, Weedone LV4 and Amizol. Yield reduction occurred in all treatments, except with 2 oz/A of ACP-L-601, ranging from 4% with 4 oz/A of Weedar MCP to 48% with 10 oz/A of Amizol. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Data

Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.	Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.
Check		51.5			Check		61.0		
WC	2	41.8	-18.9	93.6	Amizol	4	50.7	-16.9	71.4
LV4	2	40.3	-21.8	95.0	WC	6	47.7	-21.9	98.9
MCP	4	49.4	-4.1	89.0	LV4	5	54.2	-11.2	99.3
Check		54.1			Check		73.0		
ACP-L-601	2	65.5	21.0	43.9	MCP	10	52.5	-28.1	95.6
Amizol	2	53.7	-0.8	25.0	ACP-L-601	6	50.0	-31.6	89.4
WC	4	51.4	-5.0	61.0	Amizol	6	51.7	-29.2	90.2
Check		57.9			Check		60.4		
LV4	3	49.0	-15.4	85.3	ACP-L-601	8	43.9	-27.4	97.9
MCP	6	50.2	-13.3	92.2	Amizol	8	42.6	-29.5	86.1
ACP-L-601	4	53.6	-9.2	89.0	Amizol	10	31.2	-48.4	93.5

Note: WC - ethyl ester of 2,4-D; LV4 - butoxy ethanol ester of 2,4-D; MCP - amine salt of MCP; ACP-L-601 - butoxy ethanol ester of 3,4-D; Amizol - 3, amino 1,2,4-triazole.

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on oats, Series 1. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of oats (Avena sativa) were treated when 4 inches high (3 leaf) with low volatile butoxy ethanol ester of 3,4-D (ACP-L-601 at 2, 4, 6 and 8 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 5 oz/A), amine salt of MCP (Weedar MCP at 4, 6 and 10 oz/A), ethyl ester of 2,4-D (Weedone Concentrate at 2, 4 and 6 oz/A) and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). The crop was heavily infested with Russian pigweed (Axyris amaranthoides), Russian thistle (Salsola kali) and stinkweed (Thlaspi arvense). The soil was clay loam and crop and weed growth was succulent due to abundance of moisture. RESULTS: All chemicals and rates gave very efficient weed kills. In this respect, the 2,4-D formulations ranked highest, followed by Weedar MCP, and Amizol, and ACP-L-601, in order of effectiveness. Increases in crop yield were obtained with most chemicals and ranged from 24% with Weedone LV4, 2 oz/A, to 4% with ACP-L-601, 8 oz/A. ACP-L-601 and Weedar MCP were most tolerant to the oats, they caused the least delay in ripening (1 to 2 days). Slight decreases in yield were caused by the 8 and 10 oz/A rates of Amizol (5 and 8% respectively). Statistical data on yield in per cent of checks are given below. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Data

Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.	Chem.	Rate: oz/A:	Grain yield: bu/A	Grain yield: % incr.	Weed: % Loss dry wt.
Check		61.6			Check		70.3		
WC	2	75.7	22.8	95.2	Amizol	4	77.0	9.5	88.0
LV4	2	82.8	34.4	95.9	WC	6	80.5	14.4	98.3
MCP	4	73.7	19.4	96.6	LV4	5	81.1	15.3	98.9
Check		60.7			Check		62.0		
ACP-L-601	2	70.8	16.6	84.1	MCP	10	67.4	8.7	91.9
Amizol	2	63.8	5.1	85.4	ACP-L-601	6	72.2	16.4	78.2
WC	4	80.8	33.1	98.8	Amizol	6	65.6	5.8	78.0
Check		63.3			Check		65.9		
LV4	3	71.5	12.9	97.4	ACP-L-601	8	68.8	4.4	91.1
MCP	6	72.3	14.2	96.8	Amizol	8	62.9	-4.6	88.0
ACP-L-601	4	78.7	24.3	54.2	Amizol	10	60.4	-8.4	88.1

Note: WC - ethyl ester of 2,4-D; LV4 - butoxy ethanol ester of 2,4-D; MCP - amine salt of MCP; ACP-L-601 - butoxy ethanol ester of 3,4-D; Amizol - 3,amino 1,2,4-triazole.

Herbicides on oats undersown with legumes. Sentelmann, P. W. and Willard, C. J. Alfalfa and red clover were sown with 6 pecks of Clinton oats at 10 pounds per acre of alfalfa and 4 pounds per acre of red clover on March 24, 1954, in plots 6' x 25'. Simpsons Black-seeded leaf lettuce was sown with them to simulate broad-leaved weeds. Triplicate plots were treated at one of three stages: Stage A - oats with three true leaves, no canopy (April 26); Stage B - oats fully tillard, a canopy formed (May 13); Stage C - oats in the boot stage a canopy formed (May 31). DNBP was applied in 40 gallons solution per acre; all others were applied in 10 gallons. The herbicides used and the rates per acre were: alkanol amine salts of MCP and 2,4-D at 1/8, 1/4, 1/2 and 1 pound per acre; isopropyl ester of 2,4-D at 1/8, 1/4, and 1/2 pound per acre; 3,4-D at 1/4, 1/2 and 1 pound per acre; and DNBP at 1 and 2 pounds per acre. All treatments were used at all stages. All compounds significantly reduced the yield of oats at the C stage as compared with the A and B stages, but no herbicide significantly decreased the yields below that of the untreated checks. All phenoxy compounds killed all or most of the lettuce. The DNBP killed lettuce at the A stage, and approximately half of it at the 2 later stages. Generally, 1/8 pound of an amine salt of the phenoxy compounds did not injure the legume stands at any stage. All rates of the amine salts over 1/8 pound were damaging to the legume stands at the A stage before a canopy had developed. The canopy at the C stage greatly decreased the legume kill at all rates used. No difference was found between the amine salts of MCP and 2,4-D. 3,4-D was less toxic to the legumes than 2,4-D or MCP. One eighth pound of 2,4-D ester caused moderate damage to the legumes at all three stages. Higher rates of 2,4-D ester caused moderately severe to severe damage to the legumes at all stages. The legumes were more tolerant to DNBP than any other herbicide. (Contribution of the Ohio Agricultural Experiment Station.)

The effect of 2,4-D and MCP on field horsetail, Equisetum arvense, and on yield of barley. Hoyt, P. B. The chemicals were knap-sack sprayed at 5 rates: nil, 4, 8, 12 and 16 oz/A acid equivalent to 3 growth stages of the sterile shoots of horsetail in Olli barley. There was no significant difference between the effects of the two types of chemicals on the top growth of horsetail or on the yield of barley. The first application was made two weeks after the first horsetail shoots emerged and the second and third applications at two-weekly intervals thereafter. Treatments had little effect on horsetail that was less than one week old. At the time of the first application, 30% of the stand was less than one week old, at the second, 10% of the stand was less than one week old and at the third, none of the stand was less than one week old. Hence, with the first application, 100% top growth kill was not obtained by any rate; with the second this was obtained by the 12 and 16 oz. rates and with the third by the 4, 8, 12 and 16 oz. rates. Horsetail and barley were most vulnerable at time of the third application. At this time horsetail had fully emerged and had reached nearly full growth with an average height of 18" and the barley was in the flowering stage. Yield of barley from the third application was highly significantly lower than the yield from the first and second times of treatment. Despite this the 4 oz. rate applied at the time of the third application did not decrease yield over the check. The data indicate, therefore, that the most feasible treatment from the standpoint of minimum dockage to barley and maximum injury to horsetail is obtained by the 4 oz. rate of either chemical applied when the horsetail has almost reached full growth. (Contribution of Experimental Station, Beaverlodge, Alberta.)

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on barley. Pavlychenko, T. K. and Bestrop, A. J. Large size plots of barley (Hordeum vulgare) were treated when 6 inches high with butoxy ethanol esters of 3,4-D (ACP-L-601) at 3, 5, 8 and 10 oz/A) and 2,4-D (Weedone LV4 at 2½, 4 and 7 oz/A), amine salt of MCP (Weedar MCP at 4, 6 and 10 oz/A), ethyl ester of 2,4-D (Weedone Concentrate 3, 5 and 8 oz./A) and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). The crop was infested with Russian thistle (Salsola kali) and wild buckwheat (Polygonum convolvulus). The soil was clay loam and the moisture supply was very abundant during the growing season. RESULTS: All the chemicals and rates gave very effective kills of all the weeds except wild buckwheat, which was stunted and controlled quite well, especially by the higher rates of Weedone LV4 and Weedone Concentrate. All the chemicals, except Amizol were tolerant to the crop. No appreciable effects on vigor, height or maturity date were noticed and the crop yield benefited from the effective weed control. Amizol, at the stage applied and at the rates used, was very severe on the crop. The 2 oz/A rate caused severe stunting and maturity delay and the yield was reduced an estimated 15 to 20%. The 4 and 6 oz/A rates were even more severely damaged, the yield reductions being approximately 55 and 70%. The 8 and 10 oz/A treatments, although not eradicating the barley, caused such severe damage that the crop was totally ruined. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Cultural Control of Wild Oats, 1954. Brown, D. A. Experiment A. Dates of seeding, fall cultivation, post seeding tillage. The area used for this experiment was calculated to contain 45 bushels per acre of wild oats seed in the upper 6 inches of soil when work began in 1953. Normal seeding date in 1954 was May 8; delayed seeding June 10. All weed growth on plots was killed by tillage before seeding barley, which was the crop used. Plots seeded May 8, averaged 59.3 bu. barley per acre, those seeded June 10, 40.2 bushels. Fall cultivation and post seeding tillage did not significantly influence yields and in the 1954 crop did not significantly reduce the infestation of wild oats.

Infestation of wild oats expressed in percentage stand of crop was 29.6% for plots seeded at the normal date and .7% for plots seeded at the delayed date. A heavy growth of wild oats was killed prior to seeding barley June 10. The degree of infestation on the earlier seeded plots ranged from 23 to 36% of crop stand. Influence on yield of barley through this range of infestation was not significant. Possible yield of wild oats seed per acre was calculated by averaging the weight of kernels from a large number of panicles picked at random. On plots where the weed represented 36% of the stand the yield of wild oat seed would approximate 6.35 bush. (34 lb/bu) per acre. Seeds were light in 1954 and the majority dropped before the barley was cut. Weights of wild oats seed in the threshed grain were calculated. From plots seeded May 8, estimated to yield 6.35 bu/ac. wild oats seed only 1.18 bushels were threshed with the barley. In comparison the most heavily infested plots seeded June 10 would by calculation yield .4 bushels per acre of which .08 bushels were contained in the threshed grain.

Experiment B. Influence of date of seeding, rate of seeding and fertilizer on the control of wild oats in a crop of barley. Land for this experiment was calculated to contain 32 bushels per acre of wild oats seed in the upper six inches of soil after removal of a third successive crop of grain in 1952. The area was fallowed in 1953. Half the plots were seeded May 10, the other half June 10. Early seeded plots averaged a yield of 65.1 bu/ac. of barley. Those seeded June 10 averaged 37.3 bu/ac. Seeding rates of 1.25 bu/ac and 2.5 bu/ac. and 11-48-0 fertilizer at 50 pounds per acre had no significant bearing either in yield or in degree of infestation of wild oats. In barley seeded May 10 wild oats represented 5.3% of the crop stand on an average of all plots and treatments and .47% of the crop stand in all plots seeded June 10. Date of seeding was the only factor influencing the degree of infestation of wild oats. (Contribution of Experimental Farm, Brandon, Manitoba.)

Delayed seeding of wheat and barley for the control of wild oats. Sexsmith, J. J. To test the benefit of delayed seeding of spring grains for wild oat control, a test was set up in 1953 and continued in 1954 on land which had been continuously cropped for the preceding 14 years. Duplicate 618 ft x drill width plots were used for both wheat (var. Rescue 1953, var. Chinook 1954) seeded at 1 and 2 bu/A, and barley (var. Olli) seeded at 1¼ and 2½ bu/A, seeded with and without fertilizer (11-48-0 at 50 lb/A). Seedings made at the normal date following the usual seedbed preparation were compared with seedings made after approximately one month's delay, during which time the areas were worked twice in each of the two seasons. To date, there is no evident trend of effects resulting from seeding rate or fertilizer application. A definite reduction in wild oat infestation due to delayed seeding has been evident for both crops during both years, as shown in the following summary table.

Crop	Seeding Date	Grain Yield[1] 1953	Grain Yield[1] 1954	Wild Oat Culms[1] 1953	Wild Oat Culms[1] 1954
		bu/A		no/sq yd	
Wheat	Early (May 20/53; 10/54)	25.0	10.5	16.8	28.8
	Late (June 16/53; 18/54)	19.1	7.0	0.3	0.9
Barley	Early (May 21/53; 10/54)	35.8	20.0	12.1	13.9
	Late (June 16/53; 18/54)	32.6	10.5	0.4	1.5

[1] Grain yield and wild oat culm counts averaged for 10 sq yd samples from each of duplicate plots at two seeding rates and two fertilizer rates.

Although not immediately evident from above table, barley would be the preferred crop. Later than normal frosts in the last two years have allowed wheat to mature. When crop yields alone are considered, delayed seeding of spring wheat or barley is not profitable. However, under a system of alternating crop and fallow, it is doubtful if yield reduction from delayed seeding would be as pronounced. The advantage of growing out existing wild oat seed and returning fewer seeds to the land must be balanced against crop loss due to late seeding. Very likely an equal reduction of wild oats in the crop might be obtained in some seasons with less than a month's delay in seeding date. (Contribution of Canada Dept. of Agriculture, Experimental Station, Lethbridge, Alberta.)

WINTER WHEAT

Summary — W. C. Elder

Results from the only abstract submitted confirms information reported in previous years. Winter wheat was injured most from fall treatments and least by spring applications before boot stage of growth. All varieties of wheat responded alike to the 2,4-D treatments.

Abstracts

The responses of seven winter wheat varieties to 2,4-D. Wiese, A.F. and Rea, H. E. Seven varieties of winter wheat, Red Chief, Westar, Wichita, Concho, Comanche, Triumph and Vaughn Turkey were sprayed with 0.0, 0.5 and 1.0 pounds of 2,4-D ester and amine per acre at four stages of growth. The first treatment was in the fall when the wheat had from 2 to 4 tillers, the second was in the spring when the plants were fully tillered, the third was at the boot or heading stage and the fourth was during the dough stage. The highest and lowest yielding varieties were Concho and Triumph which yielded 20.2 and 11.2 bushels per acre respectively. The average yield of all varieties for the first, second, third and fourth time of treatment was 13.3, 19.6, 15.8 and 16.9 bushels per acre respectively. The yield reduction in the fall was greatest following the 1.0 pound rates of application. The loss of yield from the fall treatments was by a reduction in the number of heads (tillering) per row, and not by the yield per head. The average number of heads in two feet of row for the first, second, third and fourth treatment was 58.5, 76.4, 73.8 and 71.0 respectively, and the average weight of seeds per head for the various times of treatment was 0.295, 0.332, 0.280 and 0.312 of a gram respectively. None of the varieties showed greater tolerance to the 2,4-D treatments than did the others. (Contribution from the Amarillo Experiment Station, U. S. D. A. and Texas Agricultural Experiment Station Cooperating.)

SORGHUM

Summary

W. C. Elder

Three abstracts were submitted on sorghum giving results with herbicides applied at different rates and stages of growth. Considerable damage was reported on combine sorghum when treated with 1/2 lb/A of 2,4-D or MCP at the 9 to 11 leaf (18" height) stage of growth.

1/2 lb/A of 2,4-D did not lower yields if applied in early stages of growth, up to 16 inches in height, or after the boot stage. 1 lb. rates lowered yields slightly during the blooming period.

Amine 2,4-D was more toxic than MCP during susceptible stages of growth, while ester 2,4-D was less toxic than MCP to sorghum.

Sudan was not affected with rates of 2,4-D up to 2 lb/A.

Abstracts

The effect of 1/2 lb. 2,4-D ester applied on 22 dates on the yield of Midland sorghum. Phillips, W. M. In 1953 Midland sorghum was treated at 22 stages of development with 1/2 lb. 2,4-D ester/A. Each treatment was replicated 4 times and yield data were obtained by harvesting 2-rows 25 feet long. Statistical analysis of the data indicated a highly significant difference between stages of growth. The average no-treatment yield was 67.7 bu/A. The first 3 applications did not significantly decrease the yield. This was during the time the crop was less than 16 inches tall. Treatment number 9 was applied when the crop had 10 leaves and was approximately 18 inches tall. The yield as a result of this treatment was 53.4 bushels. During the next eight days four treatments resulted in greatly reduced yields. The lowest being 38.4 bu/A. From the late boot stage on through the heading and pollinating period the yields were not significantly reduced. Determinations were made of the average weight per hundred kernels harvested from the various plots treated at the 22 stages of growth and from the no-treatment plots. The average of the no-treatment was 2.7 grams per hundred kernels. Beginning with the 5-leaf, or second date of application, to the 75% headed, or 15th stage of application, except the 25% headed, the weight per hundred kernels was significantly higher than the weight per hundred kernels from the no-treatment plots. With only one exception, the highest weights per hundred kernels were from plots treated in the 9th to 12th stages of growth. These stages corresponded directly with the lowest yields obtained during the season. Thus, it would seem to indicate that 2,4-D applications reduced the number of kernels but increased their weight. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.)

The effect of 2,4-D applied at different stages of growth and at different rates on the yield of Midland sorghum. Phillips, W. M. Midland, a grain variety of sorghum, was treated at 4 different stages of development with an ester and amine of 2,4-D, and an amine of MCP at rates of 0, 1/8, 1/4, 1/2 and 1 lb/A. The treatments were applied when the crop was in the 4- to 6-leaf, the 9- to 11-leaf, pollinating and early milk stages. There was considerable yield reduction as a result of treatments applied when the crop had 9- to 11-leaves. The average no-treatment yield was 71.9 bu/A., 1/2 lb. 2,4-D ester plots yielded 53.2 bu., 1/2 lb. 2,4-D amine - 40.7 bushels, and 1/2 lb. MCP amine - 48.9 bu/A. Treatment of other

stages of growth caused comparatively small reductions in yield of the crop. Heavier rates of applications (1 lb/A) caused some yield reduction during the pollinating stage. When applied during periods of susceptibility increasing rates of application caused decreasing yields. (Contribution from Field Crops Research Branch ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.)

Annual weed control in irrigated Sweet Sudan grass. Wiese, A. F., and Rea, H. E. Irrigated Sweet Sudan grass, about 2 feet tall, was treated with 2,4-D amine at 0.5, 1.0 and 2.0 pounds per acre for the control of rough pigweed (Amaranthus retroflexus). The plots were 25 by 450 feet, and each treatment was replicated three times. Harvest when the Sudan grass was flowering indicated that none of the chemical treatments reduced the yields. The weeds were killed by all chemical treatments. (Contribution from the Amarillo Experiment Station, U. S. D. A. and the Texas Agricultural Experiment Station Cooperating.)

CORN

Summary

D. W. Stanifroth

Six stations contributed a total of nine abstracts. All of these abstracts reported the results of experiments with herbicides, with much attention being paid to 2,4-D, DNBP and CMU. One abstract reported results with a number of herbicides which have shown promise in past years, and continue to show promise. In general the results with 2,4-D and related materials followed the pattern of previous years and caused no changes in the recommendations for the use of 2,4-D in corn.

DNBP was tested by all stations reporting, both as a pre-emergence and a post-emergence treatment. Results appeared most promising with the post-emergence applications. In general good control of annual weeds was obtained with rates of 1 pound per acre and up to as much as 15 pounds per acre. Corn injury was evidenced by leaf burning, some stunting, and stand reductions. Most investigators felt that yield reductions had not been severe. In some tests however, the yields had not yet been obtained or the check plots had not been cultivated so that accurate evaluation of yield reduction was not easy. Only one station reported definite reductions from the use of DNBP, these occurred generally when the treatments were made on 4-6 leaf corn.

CMU was tested as a pre-emergence and a very early post-emergence herbicide. All investigators reporting on CMU, indicated good weed control, with minimum corn injury and little or no yield reduction.

Abstracts

Selective weed control in corn with foliage sprays of 3-(3,4-dichlorophenyl)-1, 1-dimethyl urea and DNBP. Buchholtz, K. P. Corn hybrid W575 was planted on May 26 on an area that had been sown to mustard greens and millet. Plots were sprayed on June 11 with a liquid preparation of 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (D) and an amine preparation of DNBP alone and in several combinations. At time of spraying the corn had 3 leaves, the foxtail was about 2 inches tall and the mustard and other broadleaved weeds had 2 true leaves. Spray equivalent to 20 gals/A was applied. No cultivations was given any plot throughout the season. On July 19 weeds were harvested from quadrats in each plot and dry weights determined. The heights of the corn plants were measured on July 8. At maturity the corn was harvested and yields of grain calculated.

Material	Appl. lbs/A	Dry wt. weeds-lbs/A 7/19 D-leaved	Dry wt. weeds-lbs/A 7/19 Grasses	Corn height inches 7/8	Corn yield bus/A
Check	--	1427	3239	41.9	52.0
DNBP	4	70**	2821	41.4	108.7**
D	2	0**	0**	34.8*	106.2**
DNBP + D	1+0.5	6**	1833*	39.3*	97.6**
"	1+1	0**	473**	37.9**	105.0**
"	1+2	0**	6**	32.6**	104.0**
"	2+0.5	0**	1126**	37.2**	100.1**
"	2+1	0**	581**	37.9**	115.0**
"	2+2	0**	60**	31.0**	113.9**
"	4+0.5	12**	1288**	37.6**	110.9**
"	4+1	12**	478**	33.8**	110.2**
"	4+2	0**	24**	32.8**	101.2**

The application of 2 lbs/A of D was effective in killing all weeds which had emerged and provided residual control of at leat 2 months more. DNBP gave initial control of grasses and broadleaved weeds but regrowth of grasses was vigorous. Combinations of D with DNBP gave a more rapid weed kill but final control was not greatly different than that obtained when D was applied alone. It was evident that initial weed kill with combinations was chiefly due to contact effects. Many plots which received 1 or 2 lbs/A of D in the combination were still nearly free of weeds at harvest.

The corn leaf injury varied from slight to severe as a result of the treatments. On July 8 all treatments had reduced the height of the corn but stands had not been affected. The corn made an excellent recovery and grain yields from treated plots were all greatly more than the yields on uncultivated, untreated check plots. Dept. of Agronomy, Univ. of Wisconsin.

Effect of date and rate of DNBP application on weed control and corn yields. Buchholtz, K. P. On May 20, 1954 a mixture of millet and mustard greens was sown on an area planted to W575 corn on the same day. On May 21 plots were treated with an amine preparation of DNBP at rates of 2, 4 and 8 lbs/A and with an ester of 2,4-D and with CMU at rates of 2 lbs/A. On June 2 when the corn had 2 leaves and on June 8 when it had 3 leaves plots were treated with 2, 4 and 8 lbs/A of the DNBP preparation. No cultivation was given any of the plots during the season. All materials were applied in water equivalent to 20 gals/A. Four replications were used. On June 14 counts of weeds remaining were made on all plots. On August 23 weedy growth was harvested from each plot and dry weights determined. When the corn was mature it was harvested, weighed and yields obtained. The soil type of the experimental area was Miami silt loam.

Date of treatment	Material	Appl. lbs/A.	Weeds/sq. ft. 6/14 B.L.	Weeds/sq. ft. 6/14 Grasses	Dry wt. weeds lbs/A 8/23	Corn yield Bus/A
May 21	DNBP	2	52.6	49.4	5150	50.1
"	"	4	43.9*	40.8	4809	72.6
"	"	8	21.8**	14.1*	5267	76.3
June 2	"	2	3.3**	18.8	3987	85.3
"	"	4	0.9**	6.9**	3760	90.0*
"	"	8	0.0**	0.6**	2489**	98.2**
June 8	"	2	0.8**	21.5	4147	92.5**
"	"	4	0.0**	15.1	3795	94.4**
"	"	8	0.1**	3.5**	3010	100.9**
May 21	2,4-D	2	8.4**	22.3	4645	87.0*
"	CMU	2	0.4**	2.9**	2758**	96.1**
Check	--	-	70.6	35.2	4840	73.2

Application of DNBP at time of planting resulted in poor control of both broadleaved and grassy weeds. The June 2 and June 8 applications gave equivalent control of broadleaved weeds but the June 2 application was somewhat better for grassy weed control. Weights of weeds harvested on August 23 showed that even the plots with the low initial stands had rather high yields of weeds. This was due to the vigorous growth of the few weedy plants which survived the treatments and to

the regrowth which came up later in the season. The 8 lbs/A application of DNBP on the last two dates injured the tips of the corn leaves but appeared to cause no significant reduction in growth. Plots treated with CMU showed some stunting for about 3 weeks.

Corn yields were affected by the stands of weeds remaining after treatment. Applications which gave good initial control of weeds produced the highest yields of corn. Application of 2 lbs/A of DNBP on the first date resulted in the lowest yields, possibly due to the increase in grassy weeds which resulted from this treatment. Dept. of Agronomy, Univ. of Wisconsin.

Pre and post emergence herbicides on corn. Churchill, B. R. and Grigsby, H. B. The field was planted to Michigan hybrid 350 in replicated randomized plots, May 20. 2-4-D ester and Kuron were applied as a pre-emergence spray and 1 and 2 pound rates and at 1/2 pound rate at emergence. Premerge (DNBP) at 3 pounds, and CMU at 1 pound were applied two weeks after first emergence. No injury resulted from any of the "pre" or "at" emergence sprays but considerable burning resulted from premerge and CMU. Both of these treatments retarded growth of the corn through the tasseling stage but stands were the same as the check at times of harvest. The 1/2 pound rate at emergence of both 2-4-D and Kuron were as effective for weed control as the heavier rates at pre-emergence. Two pounds of Kuron pre-emergence were somewhat superior to 2 pounds 2-4-D when no cultivation was made. Excellent weed control of both annual grasses and broad-leaved weeds was obtained with premerge and CMU. Yields have not been calculated. (Michigan Agricultural Experiment Station, East Lansing, Michigan).

Pre- and post-emergence herbicides on corn. Ilnicki, R. D., Ham, G. F., Flowers, J. L., and Willard, C. J. Experiments were conducted at the Northwest Substation, O.A.E.S., Hoytville, and the O.S.U. Columbus. Ohio K62 corn was drilled June 14 at Hoytville and W64 on May 20 at Columbus in 42-inch rows, and laid out in 4-row triplicated plots. Rape and millet were sown to simulate weeds at Hoytville: natural infestation at Columbus. Plots at Hoytville were treated pre-emergence on June 16-19 with the polypropylene glycol butyl ether (PGBE) esters of MCP, 2,4-D 2,4,5-T, and 2-(2,4,5-trichlorophenoxy)-propionic acid (Silvex), triethamolamine salt of 2,4-D, 3-phenyl-1,1-dimethylurea (PDU), 3-chlorophenyl)-1,1-dimethylurea (Karmex DW) and 3-amino-1,2,4-triazole (EH6029) each at 1, 2, and 4 lb/A.; butoxyethoxy propyl (BEP) esters of 2,4-D and 2,4,5-T; and 2,3,6-trichlorobenzoic acid (HC-1281AD) and its sodium salt (HC-1281S) each at 1 and 2 lb/A.; two formulations of sodium 2,4-dichlorophenoxyl ethyl benzoate (Sesin 30E and 50 W) each at 2 and 4 lb/A.; and CIPC and isopropyl N-(3-methylphenyl)-carbamate (T516) each at 2, 4, and 8 lb/A. On July 9 (8-9 leaves) EH6029 was applied as a directed spray at 1/2 and 1 lb/A. and as an overall spray at 1 lb/A. All rates are in terms of the active ingredient and all applied in 40 gallons spray per acre. Checks with and without cultivation were included. Chemicals giving outstanding weed control were the ureas, isopropyl and PGBE esters of 2,4-D, and EH6029, applied pre-emergence, at the 2 and 4 lb. rates. The BEP ester of 2,4-D at 2 lb. gave very good control, while Silvex ester, PGBE ester of 2,4,5-T, and 3,4-D gave fair to good control of both grasses and broadleaves at their highest rates. The lower rates were ineffective. Of the carbamates, CIPC was the more effective. The 4 and 8 lb. rates gave good to excellent grass control with poor control of broadleaves. Of the herbicides above only PDU at the 4 lb. rate damaged corn. About midseason these plots exhibited stunting and yellowing but these effects were later outgrown. Both Sesin formulations gave fair control of all weeds at the 4 lb. rate. Lower rates were ineffective. HC1281 at both rates and its salt at 1 lb. gave poor control; however, the 2 lb. rate of the salt produced fair control of all weeds. MCP, BEP ester of 2,4,5-T and (EH6029) applied post-emergence, were not effective at any rate. MCP at 4 lb. stunted corn initially but the effect was later outgrown. Amino triazole applied as an overall spray produced some plants lacking chlorophyll; however, chlorophyll appeared later

in the growing season. The test at Columbus included much fewer herbicides and fewer rates. The results were generally similar, except that lower rates of the phenoxy compounds were effective pre-emergence at Columbus, on a low-organic-matter soil. CIPC was mediocre at 4 lb. and only fair at 8 lb/A. (Contribution of the Ohio Agricultural Experiment Station).

The use of dinitros on corn. Ilnicki, Richard D., Ham, George F., Flowers, Jefferson L., and Willard, C. J. Experiments were conducted at the Northwest Substation, O.A.E.S., Hoytville, (Ilnicki), Columbus (Ham and Flowers). Corn was drilled June 14. A mixture of rape and millet was sown in Ohio K62 corn to simulate a weed population at Hoytville; natural population at Columbus. Triplicated 4-row plots were used, treated with alkanol amine salts of DNBP, (Premerge). Treatments and results were: On June 16 DNBP was applied at 3, 5, 7, 10, and 15 lb/A in 40 gpa of spray. 15 lb/A gave 95 and 100% control, respectively, of grass and broad-leaved weeds. On June 21 (Coleoptile visible) the same rates were applied in 40 gpa and 10 gpa of solution and low rates were much more effective: 3 lb/A gave 97 and 100% control, respectively, of grasses and broadleaves. Rates of 1, 2, 4, and 6 lb. were applied as overall sprays on June 28 (4-5 leaves on corn) at both 40 and 10 gpa of water. The 2 lb. rate gave 85% grass control. Directed sprays of 1, 2, 4, and 6 lb/A were applied on July 2 (6-7 leaves) and July 9 (8-9 leaves). Overall sprays in 10 and 40 gpa at 4 and 6 lb/A were also applied on those dates. All post-emergence rates gave complete control of broadleaves, regardless of dates of treatment or spray volume. The 2 lb. rate gave 96, and 82% control, resp., of grasses applied in high volume directed spray on July 2 and 9. Low volume sprays were not as effective on any date. The directed spray was superior to the overall spray. Corn foliage intercepted some of the overall spray. By July 9 the grasses were established and more resistant. Corn was not injured on June 16 and 21. All rates produced leaf burning on June 28, but this was rapidly outgrown. Corn was not seriously damaged by directed sprays July 2 and 9. Overall sprays on those dates stunted and burned corn severely, especially with the low volume spray. Apparently effective grass control can be obtained with low rates of dinitros for a period of at least 10 days following corn emergence, and high volumes of directed sprays are more effective in the later post-emergence applications. At Columbus, DNBP was applied at 5, 7 1/2, and 10 lb/A pre-emergence, and 1, 2, and 4 lb/A at the coleoptile, 2 to 3-leaf and 5 to 6-leaf stages, at 40 gpa. The results were similar to those reported above for Hoytville. (Contribution of the Ohio Agricultural Experiment Station.)

Application of high rates of 2,4-D to the soil previous to planting corn. Keyser, H. R. and Sand, P. F. Corn was planted on waukeshaw silty clay loam on June 5, 1954. Previous treatment had been fall plowing, followed by an application on different plots of 40 pounds per acre of 2,4-D amine and 40 pounds per acre of 2,4-D ester on April 28, 1954. The soil was disced about a week before planting. 5.82 inches of rain fell between time of application of the 2,4-D and the time of planting. No 2,4-D symptoms were observed on the corn at any time and there were no significant differences in yields. The yields from the 40 pound rate of amine and ester were 71.2 and 58.7 bushels per acre respectively and the yield of the check was 65.7 bushels per acre. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Pre- and post-emergence with DNBP for foxtail control in corn. Lee, Oliver C. Rates of DNBP of 8, 12 and 16 lb/A were applied 4 days after planting corn in a field heavily infested with giant foxtail (Setaria faberi). The 8 lb. rate reduced the stand of foxtail slightly, while the 12 and 16 lb. rate prevented the growth of foxtail for approximately 30 days. Seedlings emerging after that continued to

grow, resulting in a heavy infestation of foxtail at harvest time. The 8 lb. rate did injure the corn. The 12 and 16 lb. rates reduced the stand of corn approximately 20 and 40%, respectively. Rates of 3.3, 4.9 and 6.5 lbs. of DNBP were applied when corn was 4 in. in height. The two heavier rates destroyed the foxtail but caused severe stunting of the corn. The stand on these plots was reduced about 40%. Yields were not taken. (Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Control of weeds in corn with Dinitro and 2,4-D. Sand, P. F. Field Corn planted May 31, 1954 was treated at the emergence and 2-3 leaf stage with 3,4, and 6 pounds per acre of DNBP and 1 and 2 pounds per acre of 2,4-D amine salt and 2,4-D isopropyl ester. The surface of the soil was dry at the time of application for both stages and 3.05 inches of rain were received between the time of application and June 24 the date the notes on weed control were taken. Percent kill of weeds from the dinitro at 3, 4, and 6 pounds per acre was 89, 94 and 97% control at the emergence stage and 95, 97 and 98% control at the 2-3 leaf stage. 2,4-D amine at 1 and 2 pounds per acre gave 78 and 88% kill at the emergence stage and 80 and 88 percent kill at the 2-3 leaf stage of growth. 2,4-D isopropyl ester at 1 and 2 pounds per acre gave 81 and 94% kill at the emergence stage and 86 and 94% kill at the 2-3 leaf stage. The weeds concerned were mostly pigweed. No injury to the corn was observed by the 2,4-D treatments, however, the dinitro produced a slight burning from which the corn recovered rapidly. No significant differences in yields resulted from any of the treatments. The yields of most of the treated plots averaged slightly higher than those of the checks. (Contribution of the Department of Agronomy College of Agriculture, Lincoln, Nebraska.)

Effect of DNBP post-emergence sprays of yield of corn. Staniforth, D. W. The alkanolamine salt of DNBP was applied at the rate of 3.75 pounds per acre in 30 gallon of water. Treatments were made May 25, June 3 and June 12. At each date corn was treated at each of three stages of growth, namely, coleoptile emerged, corn 2-3 leaves and corn 4-5 leaves. Weather conditions at each time of treatment were as follows. May 25, cloudy, temperature 70 degrees F. June 3, cloudy, rain showers, temperature 60 degrees F. June 12, sunny, clear, temperature 75 to 80 degrees F. Observations of weed injury were made 4 to 5 days after each date of treatment, and then the plots were maintained in a weed-free condition for the rest of the season. Weed control was generally good at all dates of treatment, but was potentially less effective at the first date since few weeds had emerged. Corn injury as evidenced by leaf burn was most severe at the June 3 and June 12 dates of application, and most servere on plants at the 4-5 leaf stage of growth. Corn plots were 2 x 5 hills with guard rows, and thinned to 3 plants per hill. A check plot was included for each DNBP plot, with four replications. The average yield for all DNBP treated plots was 5.3 bushels less than the check plots, a significant difference by statistical calculation. The only treatment which was not less than the check plots was the one made May 25, with corn at the 4-5 leaf stage. Treatments at the 4-5 leaf stage on June 3 and 12, were 12.6 and 12.9 bushesl less than their respective checks. The June 12 treatments caused the greatest yield reductions at all three stages of growth and the May 25 treatments caused the least yield reduction. Yield reductions were not due to stand reductions, since the plots were thinned after the chemical treatments had been made. (Iowa Agricultural Experiment Station, Ames, Iowa.)

Flax

R. G. Robinson

Summary

TCA at about 5 lb/A on young flax was generally successful in controlling Setaria species without serious injury to flax. Dalapon at about 2½ lb/A gave equally good control of Setaria species but more flax injury than TCA. The Dalapon formulation not containing a wetting agent is promising and needs more testing on flax at rates of 1½ - 2½ lb/A in comparison with TCA at 5 lb.

Amizol was injurious to flax and did not give satisfactory weed control when applied either pre- or post-emergence.

3,4-D ester was less effective than 2,4-D ester on Russian thistle, Russian pigweed, and stinkweed and was equally injurious to flax.

Russian thistle can be partially controlled in flax with 2,4-D ester at a rate of 3 oz/A. Late treatments near bud stage of flax to curl down the thistles and make direct combining practical are effective but are more injurious to flax yield than earlier treatment which reduces thistle competition with flax.

Published in the annual weed section of this report are three abstracts (Wood-Fox, Wood-Vodrey-McKenzie, Shebeski-Burrows) dealing with wild oat control in flax. Post-emergence applications of CMU, TCA, and Dalapon did not give satisfactory selective control of wild oats in flax. Fall applications of IPC at 10, 15, or 30 lb/A gave excellent wild oat control the following spring but resulted in some flax injury. Fall application of Endothal at 7½, 15, or 22½ lb/A killed flax the following spring and did not control wild oats. Fall application of TCA at 15, 30, 45, or 60 lb/A did not injure flax the following spring and gave good control of wild oats.

Abstracts

Comparison of TCA and Dalapon applications to weed-free flax. Andersen, Robert N. and Helgeson, E. A. Dalapon at 1, 2, 4, 6, 8, and 12 lb acid equiv/A; and TCA at 4 and 8 lb acid equiv/A were applied to Victory flax growing on a Bearden silty clay loam at Casselton, N. Dak. One series of plots was treated June 4, 1954 when the flax was 2½-3 in tall, another series was treated June 22 when the flax was 13-18 in tall and just starting to bud. Weeds were controlled by two wheel hoeings.

Results: All treatments except 4 lb of TCA resulted in highly significant yield reductions, with stage of growth at time of application having a negligible effect. Rates of Dalapon of 4 lb and above reduced yield to practically nil. Dalapon treated plots were greatly delayed in flowering and maturing. It was noted that Dalapon caused the dropping of buds and immature bolls. This occurred to some extent even at the 1 lb rate and at both times of application. (Field Crops Research Branch, A. R. S., U. S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N. Dak.)

Control of green foxtail (Setaria viridis) with TCA and 2,2-dichloropropionic acid, sodium salt (Dalapon). Keys, C. H. An area of wheat stubble, uniformly infested with green foxtail, was sown to Dakota flax about mid-June. When the flax was about 3-4 inches high and the green foxtail ranged from the seedling to five leaf stage, replicated, randomized, square rod plots were treated with sodium TCA at 4, 6, 8, and 12 lb/A and Dalapon at 4, 6, and 8 lb/A in water at the rate of 80 gal/A.

Results: All rates of TCA effected a complete kill of green foxtail and there was no post-treatment germination. Yields of flax from the TCA treated plots ranged from 82-97% of the check or untreated areas which averaged 6.4 bu/A. All rates of Dalapon resulted in complete kills of green foxtail, with no regrowth, but the flax was severely retarded and there was very little seed produced. Yields of flax from these plots ranged from 10-40% of the untreated plots. (Scott, Saskatchewan).

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on flax. Pavlychenko, T.K. and Bestrop, A. J. Large size plots of flax (Linum usitatissimum) were treated when 2 in high with low volatile butoxy ethanol esters of 3,4-D (ACP-L-601) at 2, 4, 6, and 8 oz/A and 2,4-D (Weedone LV4) at 2, 3, and 5 oz/A, amine salt of MCP (Weedar MCP) at 3, 5, and 8 oz/A, ethyl ester of 2,4-D (Weedone Concentrate) at 2, 4, and 6 oz/A and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8, and 10 oz/A. The crop was very heavily infested with Russian pigweed (Axyris amaranthoides), stinkweed (Thlaspi arvense) and Russian thistle (Salsola kali). The soil was clay loam and moisture was abundant.

Results: Highly effective weed kills occurred with Weedone Concentrate, Weedar MCP and Weedone LV4 (dry weight reductions from 98 to 69%) while less effective kills were obtained with ACP-L-601 and Amizol (dry weight reductions from 72 to 6%). The flax was quite tolerant to all rates of Weedar MCP and to the two lower rates of Weedone LV4, Weedone Concentrate and ACP-L-601. Although the maturity date of the crop was delayed by all these treatments (3 to 10 days) the effective weed kill allowed crop yields to be increased significantly (71% with 3 oz/A of Weedar MCP). The highest rates of Weedone Concentrate, Weedone LV4 and ACP-L-601 and all rates of Amizol were too severe on flax. The vigor of the crop was somewhat reduced by these treatments, maturity was delayed badly (as much as 13 days with 8 oz/A of Amizol) and crop yields were decreased, ranging from 1% with 4 oz/A of Weedone Concentrate to a 72% with 10 oz/A of Amizol. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan).

Giant foxtail control in Marine flax. Robinson, R. G. and Dunham, R. S. Flax was sown April 20, 1954, on productive silt loam soil naturally and heavily infested with Setaria faberii. All plots were sprayed June 4 with MCP at .25 lb/A to control marsh elder. Amizol, applied pre-emergence at 1.0 or 6.0 lb/A, injured flax at both rates and failed to control the foxtail. TCA or Dalapon were applied June 2 when the flax was 7 in tall and the foxtail had 6 leaves. The Dalapon formulation did not contain a wetting agent. Both herbicides killed 100% of the foxtail but a few plants appeared later in the season on the TCA plots. The TCA at 5 lb/A did not injure flax. Dalapon at 2½ lb/A injured early blossoms, delayed maturity slightly, and resulted in some lodging. At 5 and 7½ lb, Dalapon severely injured early blossoms, delayed maturity, and caused severe lodging. Yield of flax on the unsprayed plots averaged only 1.0 bu/A. Yields on sprayed plots averaged from 9 to 10 bu/A. The unexpectedly high yields on the Dalapon plots at 5 and 7½ lb rates were due to an unusual development of a second crop of blossoms and bolls. (Cont. from the Dept. of Agron. & Pl. Gen., Univ. of Minn., St. Paul, Minn. Paper No. 3247 Sci. Jour. Series, Minn. Agri. Exp. Sta.)

Effects of three rates of 2,4-D ester applied at different growth stages to Russian thistle infested flax. Sexsmith, J.J. During the 1951 to 1954 seasons 2,4-D ester at rates of 2, 3, and 6 oz/A has been tested as a herbicide against a naturally occurring infestation of Russian thistle in flax. Quadruplicate applications were made at intervals of 5 or 6 days over the period extending from a few days after emergence of the flax through to full boll formation. Assessment of treatments has been made by visual rating of injury to both flax and weeds, time of ripening, and crop yield (1954 yields not available). As was to be expected, seasonal differences have caused some variation in results. In general, best control of Russian thistle consistent with highest yields of flax has been obtained from 3 or 6 oz 2,4-D ester applied between 27 and 36 days after seeding. Such a treatment has not resulted consistently in a crop that could be most easily harvested. In three of the four years, treatments applied at or near bud stage of the flax have given a reasonably good curl-down to Russian thistle, which would allow for combine harvesting above the weed mass, but yields have been seriously reduced below that of earlier treatment or untreated checks. All of the 2,4-D applications found to be of any value for use against Russian thistle in flax have resulted in maturity delays of one week or more. (Canada Dept. of Agriculture, Experimental Station, Lethbridge, Alberta).

Effects of late application of several systemic herbicides to Russian thistle in flax. Sexsmith, J.J. Russian thistle infested flax was treated with several herbicides to compare the effects on flax in a susceptible stage and on thistles when resistant to killing. Quadruplicate treatments of esters at 0, 2, 3, and 6 oz/A and amines at 0, 3, 6, and 12 oz/A were applied 48 days after flax seeding, at which time the flax was 10 to 14 inches tall to first bud and the Russian thistles up to 10 inches tall and well branched. The chemicals used were: Esters - 1. butyl ester 2,4-D, 2, isooctyl ester 2,4-D, 3, propylene glycol butyl ether ester 2,4-D, 4, butoxy ethanol ester 2,4-D, 5, butoxy ethanol ester 4-C, 6, ester of 3,4-D; Amines - 7, mixed amine 2,4-D, 8, isopropyl amine 2,4-D, 9, amine MCP. From standpoint of Russian thistle control, as judged by visual scoring for curl-down 2½ months after treatment, none of the low-volatile esters of 2,4-D (2, 3, and 4) were superior to the butyl ester, whereas 4-C and 3,4-D were less effective than 2,4-D esters, and the amines of 2,4-D were superior to amine MCP. At time of harvest, height measurements were made on both crop and weeds. All rates of all chemicals significantly reduced the height of flax, and all chemical rates but 2 oz 4-C and 3 oz amine MCP caused significant height reduction of Russian thistle. The advantage of such late treatment would be to provide sufficient height difference between crop and weeds to allow for combining above weeds. Taking an arbitrary difference of 7 inches, none of the rates of 4-C, 3,4-D, or amine MCP were effective, while all other treatments were. Information as to maturity delays and flax yields is not available as yet. (Canada Dept. of Agriculture, Experimental Station, Lethbridge, Alberta).

Flax

(Received too late to be included in summary and with other abstracts)

Effect of herbicides on flax, 1954. Brown, D. A. Experiment A. The Rocket variety of flax was treated with 4 oz/A each of 2,4-D and MCP esters, and 8 oz/A each of 2,4-D and MCP amines at twenty stages of growth beginning one day prior to emergence of plants and continuing thereafter at two to four day intervals until the blossom period was well advanced. All formulations significantly reduced yields and injured the crop at the 16 to 20 dates of treatment, or, at a stage when flax plants were in full bloom up to the latter stages of bloom. Ester of 2,4-D significantly reduced yields from dates 12 to 20, or from the time plants were showing buds onward. Other formulations and rates inflicted no significant injury prior to the full bloom stage. There was a slightly but insignificantly lower yield attached to all treatments from the first to third dates. The 1954 results showed that the formulations and rates used could be applied to flax plants without measurable injury and reduction of yield from the time the crop emerges up to early bud.

Experiment B. A crop of Rocket flax was treated when 3 in high with TCA at 3, 6, and 12 lb/A; CMU at ½, 1, and 2 lb/A; Dalapon at 2, 4, and 8 lb/A; MCP sodium salt alone and in combination with the various rates of soil sterilants at 6 oz/A. Dalapon used for the first time was applied in excess of flax tolerance and the crop was wiped out at all rates. There was no significant difference in yield either between CMU and TCA or between rates of application within each chemical group. In fact, yields from all plots treated were on a level with untreated plots. (Experimental Farm, Brandon, Manitoba).

Herbicidal control of weeds in flax. Brown, D. A. Experiment A. Comparison of 2,4-D and MCP. Standard esters of 2,4-D and MCP were applied at rates of 4 oz/A and amines of the same two chemicals at 8 oz/A. Treatments were made to a crop of Rocket flax at 20 stages of growth from pre-emergence until bloom was past. Weeds prevalent in all plots were:- stinkweed, lambsquarters, red root pigweed, Russian thistle, wild buckwheat and common nightshade. Results: In general, treatments made before the flax was 3 in high gave very poor control of weeds irrespective of formulation and rate. Best control was achieved when flax plants were approximately 8 in high giving a favorable range from 4-12 in. From the time flax was 14 in high, annual weeds were too far advanced to be killed before seed set. Ratings were given each treatment on the basis of general weed control throughout the period of twenty applications. On percentage weed kill, 2,4-D ester was rated 54, MCP ester 50, 2,4-D amine 50 and MCP amine 48. Stinkweed and lambsquarters were killed equally well by all treatments. Ester of 2,4-D appeared superior to the others for the harder to kill weeds. MCP ester and the two amines were very closely rated for all weeds present. Experiment B. TCA, CMU and Dalapon for control of weeds in flax. TCA was applied at 3, 6, and 12 lb/A, CMU at ½, 1, and 2 lb and Dalapon at 2, 4, and 8 lb/A. MCP sodium salt at 6 oz/A was applied alone and in combination with each rate of the soil sterilants. The experiment therefore included the soil sterilants alone and in combination with MCP, MCP alone and the check which received no treatment. Treatments were made when the crop was 3 in high. Weeds prevalent were: wild oats (heavy), stinkweed, lambsquarters, wild buckwheat, red root pigweed, and wild millet. TCA gave good control of the millet at all rates but made little impression on wild oats. CMU controlled millet at all rates and 40% of wild oats at the 2 lb rate. Dalapon was applied too heavily and not only killed all weeds at all rates but ruined the flax crop. MCP alone controlled the broadleaved weeds reasonably well but wild oats flourished in these plots. Cleanest and best plots were those receiving the combination treatments TCA and MCP at all rates and CMU at the 1 and 2 lb rates with MCP. Dalapon was used at Brandon in this test for the first time. Rates were too high. (Experimental Farm, Brandon, Manitoba, Canada).

Post-emergence application of Dalapon in 1954 at Fargo and Hatton, N. D. and Hendrum, Minn. to control wild oats in Marine flax. MacDonald, W. P., Zinter, C. C. and Slough, A. T. The Dalapon sodium salt formulation (equivalent to 78% alpha, alpha, dichloropropionic acid, plus wetting agent) was applied at 1, 2, and 4 lb of product/A with 10 gal water solution and was applied with all rates on flax as a post-emergence spray for wild oat control. Plots were sprayed at 2 or 3 stages of growth to determine effect of spraying on the different stages. Flax was approximately 2, 4, and 6 in, oats 4, 6, and 8 in in height. Plots were triplicated and randomized. Plots treated with 1 lb of Dalapon, regardless of height of flax or oats, gave unsatisfactory control of wild oats and little if any reduction in yield of flax. Plots treated with 2 and 4 lb of Dalapon gave 50 to 90% control of wild oats. Earlier applications of Dalapon gave lower reductions in yield, but all spraying reduced yields from 2 to 10 bu/A. Control of Setaria spp. was good at 2 and 4 lb rates. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.)

SOYBEANS AND PEAS

Summary

F. W. Slife

Chemical weed control in soybeans and peas is progressing, but not so rapidly as in crops that belong to the grass family. Results with pre-emergence herbicides continue to be encouraging, but because of the variability of results this type of treatment has not been widely recommended.

Two abstracts were submitted on the effect of a variety of pre-emergence chemicals on soybeans. DNBP and CIPC gave good control of weeds but produced injury at the higher rates of application. The 2,4-D types of materials, although giving good control, injured soybeans severely in most cases. Alanap continued to give good results in Ohio. Two abstracts were also submitted on post-emergence treatments on soybeans. They indicate that light rates of 2,4-D or herbicidal oils may have a place in controlling weeds in soybeans. One reported that soybeans planted in the spring were not affected by several formulations of 2,4-D applied to the soil at 40 pounds per acre in the previous fall to control perennial weeds. The other, on yield of soybeans as influenced by stand, indicates that stand could be reduced materially before any yield reductions would be noticeable.

Several reports were included on the effect of both pre-emergence and post-emergence treatments on peas. Two workers reported on pre-emergence trials with a variety of chemicals. In general, at rates necessary to control weeds, the chemicals injured the peas. There were five abstracts on post-emergence treatments. MCP and dinitro seemed to give satisfactory results, but more injury was reported with MCP this year than in previous years. When used at the same rate as MCP, 2,4-D caused more damage. One investigator submitted an extremely important abstract on the effect of spray volume on the tolerance of peas to 2,4-D and MCP. With each increase in volume of water, injury decreased when the rate of either chemical was held constant.

Abstracts of Results of Cooperators

Pre-emergence herbicides on soybeans. Ilnicki, R. D., Flowers, J. L., Ham, G. F., and Willard, C. J. Monroe soybeans were drilled solid in 25-foot plots, triplicated, and a mixture of rape (1 part) and German millet (2 parts) was sown broadcast from the grass-seed attachment of the drill. They were sown on May 15 on Hoytville clay at the Northwest Substation, O.A.E.S. (Ilnicki) and on May 10 on a Miami-Brookston complex at Columbus (Ham and Flowers). Herbicides were applied on May 18-20 and 24 at Hoytville and on May 13, 14, and 15 at Columbus.

Treatments at Hoytville were: Alkanol amine salts of DNBP (Premerge) at 5, 7, 10, and 15 lb/A 3 days and 9 days after planting; N-1-naphthyl phthalmic acid (Alanap 1) and its sodium salt (Alanap 3) at 2, 3, r, and 6 lb/A; CIPC at 4, 6, 8, and 10 lb/A; CMU (Karmex W) and 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (Karmex DW) at 1, 2, and 4 lb/A; disodium 3,6-endoxohexa-hydrophthalate (Endothal 3003) at 4, 8, and 10 lb/A; alkanol amine salts, polypropylene glycol butyl ether (PGBE) esters of 2,4-D and MCP, and isopropyl ester of 2,4-D at 1 and 2 lb/A; triethylamine salt and the PGBE ester (Kuron) of 2(2,4,5-trichlorophenoxy)-propionic acid (Silvex) at 1/2, 1, 2, and 4 lb/A; sodium 2,4,5-trichlorophenoxy ethyl sulfate (Natrin) at 2,4, and 6 lb/A; and SES (Crag 1) at 1, 2, and 4 lb/A.

Excellent weed control was obtained with DNBP, Alanap 1 and 3, and CIPC. As usual DNBP applied one day before the beans emerged was superior to an early application. Alanap 1 and 3 controlled most weeds but failed to control smartweeds. CIPC gave complete control of smartweeds at 6 and 8 lb/A but did not control ragweed. Karmex DW and Karmex W at 2 lb/A reduced soybean stands by 27 and 63% respectively but gave good control of weeds. Endothal 3003 gave 93 and 97% control of grasses at 8 and 10 lb/A respectively but did not control broadleaves. MCP and 2,4-D formulations gave good weed control (the esters were more effective). 2,4-D at 2 lb/A gave 70% control of grasses and 85% control of broadleaves, while Kuron and Silvex amine at 4 lb/A gave 70% control of grasses and 85% control of broadleaves. Slight reductions in soybean stand were noted in all 2,4-D and MCP plots. Natrin at 6 lb/A gave 60% control of grasses and 73% control of broadleaves, with a stand reduction of 30%. Crag 1 at 4 lb/A gave 84% control of grasses and 90% control of broadleaves, with an 18% stand reduction.

At Columbus the delayed applications of Premerge at 5 and 15 lb/A on May 15 were effective at all rates and were superior to May 13 applications. The Alanaps gave good results, as heretofore, but injured soybean stands somewhat at 8 lb/A for the first time. 2,4-D and CIPC were generally less effective at Columbus than at Hoytville. Karmex DW and Karmex W gave poor control of weeds at 1 lb/A; at 2 and 4 lb/A both beans and weeds were largely killed. (Contributed by Ohio Agricultural Experiment Station, Columbus, Ohio.)

Application of high rates of 2,4-D to the soil previous to planting soybeans. Keyser, H. R. and Sand, P. F. Hawkeye soybeans were planted on Waukeshaw silty clay loam on June 5, 1954. Previous soil treatment consisted of fall plowing followed by application of 40 pounds each of 2,4-D isopropyl ester and 2,4-D amine salt on April 28. Between the time of application and planting, 5.82 inches of rain fell. The soil was disked about one week before planting. No 2,4-D symptoms were observed on the soybeans at any time. No significant differences in yield were obtained. Yields of the amine, ester, and check plots were 34.7, 35.2, and 35.2 bushels per acre respectively. (Contributed by Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Effect of 2,4-D as a post-emergence spray on soybeans. Slife, F. W. and Smith, R. J. In 1952, 1953, and 1954, 2,4-D amine was applied as a post-emergence spray to Hawkeye soybeans. The experimental design was a randomized block with four replications. The soybeans were planted in rows 40 inches wide and cultivated three times during the growing season. Treatments were made with an experimental sprayer mounted on bicycle wheels. One row a rod long was harvested for yield from each replication for each treatment. Treatments each year were made at four stages of soybean growth. These stages were (1) 4-5 inches tall, (2) 8-10 inches tall, (3) 18-20 inches tall, and (4) 30-32 inches tall. Treatments at each stage of growth were 2,4-D amine at 1/16, 1/8, 1/4, and 1/2 pound of acid per acre.

None of these treatments at any stage of growth killed the soybeans. All treatments delayed maturity slightly. Yield reductions varied both with date of treatment and with rate of treatment. Yield reductions were most severe at the 1/2-pound rate for the fourth treatment but were less severe at each earlier treatment date. Although yields have not been analyzed, it appears that 1/16 and 1/8 pound applied at the first treatment date have not affected yields, but these rates have reduced yields slightly at the later treatment dates. Height of soybean plants was affected by these treatments. The 1/16-pound rate

caused no height reduction at the first treatment but reduced plant height slightly as treatment progressed. The 1/2-pound rate reduced mature plant height by several inches in the first treatment and by 1 foot in the last treatment.

This three-year study indicates that 1/16 pound and 1/8 pound of 2,4-D acid in the amine form, if applied to soybeans when they are 4-5 inches tall, will not affect yields. The 1/8-pound rate, although light, is sufficient to kill giant ragweed (Ambrosia trifida), cocklebur (Xanthium spp.), pigweed (Amaranthus retroflexus), and annual morning glory (Ipomea purpurea) if these weeds are in the seedling stage of growth. Smartweed (Polygonum pennsylvanicum) and velvet leaf (Abutilon theophrasti) are usually controlled and sometimes eradicated. Although the 1/8-pound rate could be used on soybeans at a more advanced stage of growth with no serious effect on yield, it would not control these weeds if they were more than 6-8 inches tall. This treatment has possibilities in bottomland areas where the above listed weed species are particularly prevalent. (Contributed by Department of Agronomy, Agricultural Experiment Station, Urbana, Illinois.)

Pre-emergence herbicides in soybeans. Smith, R. J. and Slife, F. W. Soybeans (var, Hawkeye) were drilled in a clay loam soil on May 10 and May 26, 1954. A randomized complete block with four replications was used in each of two experiments. Plots were 6.6 x 28 feet with border rows. Chemicals and rates used, in pounds of acid per acre were as follows: DNBP (alkanol amine salts), 6, 8, and 10; CIPC, 6, 8, and 10, sodium PCP, 11.2, 15, and 18.8; 2,4-D amine salt, 1 1/2, 2 and 2 1/2; and NP, 4, 6, and 8. Chemicals were applied at specific rates in 34 gallons of water per acre with a sprayer mounted on bicycle wheels. In the early-planted experiment, the herbicides were applied on the day of planting; but in the late-planted experiment, the herbicides were applied four days after planting. In both experiments yield was taken by harvesting two rod-rows from each plot.

Results: Early-planted experiment: Only 0.6 inch of rainfall fell in the two weeks following the herbicidal applications and consequently no signs of either crop injury or satisfactory weed control were visible immediately. However, during the last five days of May and the first eight days of June, 3.8 inches of rainfall occurred.

Notes on crop injury taken on June 11 indicate that NP caused slight injury at 2.5 lb/A; sodium PCP caused some injury at 18.8 lb/A. The injury caused by 2,4-D and NP was reduction in size of plants, while that caused by sodium PCP was a brown or yellow chlorosis that developed in the leaves. The other chemicals caused no visible injury to the crop.

Stand reduction ratings indicated that there was injury to the the crops much earlier than the crop injury ratings showed. DNBP at 10 lb/A, NP at all rates, and 2,4-D at 1.5 and 2 lb/A caused slight (10-15%) reductions in crop stand. 2,4-D at 2 lb/A caused a 30% reduction in stand. Weed ratings taken on June 11 indicated that DNBP at 10 lb/A and NP at 8 lb/A, gave 60-70% weed control; CIPC at 8 and 10 lb/A and 2,4-D at 1.5 and 2.5 lb/A gave 70-85% control. The other herbicides and rates gave control of 50% or less. Yield data indicate that, compared with the other herbicides, 2,4-D caused a significant reduction in yield. At the 2.5 lb/A rate 2,4-D caused the greatest reduction of all.

Late-planted experiment: Heavy rainfall occurred after the herbicides were applied. In the two weeks that followed, 3.2 inches of rain fell. Crop injury ratings taken three weeks after the applications indicate that DNBP at 8 and 10 lb/A, CIPC at 10 lb/A, and 2,4-D at all rates caused some injury; however 2,4-D at the 2.0 and 2.5 lb/A rates caused the most injury. The type of injury that occurred was a reduction in size of plants.

Weed ratings indicated that DNBP and NP at 8 lb/A and sodium PCP at 15 lb/A controlled weeds to the extent of 60-70%. CIPC at all rates, DNBP at 10 lb/A, sodium PCP at 18.8 lb/A, and 2,4-D at all rates controlled gave 75-90% control. Yield data indicated that the plots treated with CIPC, sodium PCP, and 2,4-D yielded significantly less than those treated with DNBP or NP. 2,4-D applied at 2.5 lb/A caused the greatest reduction in yield.

The principal weed species present were smartweed (Polygonum spp.), crabgrass (Digitaria spp.), pigweed (Amaranthus hybridus), and wild buckwheat (Polygonum convalvulus). The better weed control in the late-planted experiment probably resulted from the fact that there was more rainfall after the herbicidal applications and consequently better dispersion of the herbicides throughout the soil. (Contributed by Department of Agronomy, Illinois Agricultural Experiment Station, Urbana, Illinois.)

Post-emergence oil sprays on soybeans. Smith, R. J. and Slife, F. W. Soybeans (var. Hawkeye) were drilled in a clay loam soil on June 9, 1954. A randomized complete block design with four replications was used. Lion herbicidal oil No. 1 (LHO-1) was applied to one-row plots (3.3 x 28 ft.) at 7 days (1 trifoliate stage), 14 days (3 trifoliate stage), 21 days (5 trifoliate stage), and 28 days (7 trifoliate stage) after the soybeans emerged. A sprayer mounted on bicycle wheels was used, and drop nozzles were employed to get accurate placement. The oil was applied at the rate of 5, 7 1/2, and 10 gal/A to the stems of the soybeans at ground level and between the primary leaves and the first trifoliate leaf. One rod-row was harvested from each plot.

Results: The oil injured the plants much more when it was applied between the unifoliate and trifoliate leaves than when applied at ground level. Treatment at 5 and 7 1/2 gal/A caused very little injury when applied at ground level, but caused a considerable amount of chlorosis and burning of leaves and petioles when applied high on the plants. At the rate of 10 gal/A plants were injured by all treatments, although the higher treatment was more severe than the lower. The high treatment caused severe burning of leaves, petioles, and stems and even reduction in stands; the lower treatment caused the plants to lodge. For the various rates, degree of injury was about the same at different stages of growth, but recovery seemed to occur faster when the plants were treated in the earlier stages of growth.

For best results, oil sprays should be applied to soybeans early (1 to 2 weeks after planting), as they recover more rapidly then and also the weeds are more susceptible to the oil when they are young. Yield data indicate that yields were significantly lower with the high-placement treatment than with the low when 10 gal/A was applied. The treatments at 5 and 7 1/2 gal/A caused no reduction in yield. (Contributed by Department of Agronomy, Illinois Agricultural Experiment Station, Urbana, Illinois.)

Yield of soybeans as influenced by stand. Smith, R. J., and Slife, F. W. Many times when herbicides are applied to soybeans, stands are reduced because

unfavorable conditions following treatment make the herbicides toxic to the beans. The purpose of this experiment was to study the effect of stand reduction on yield.

Soybeans (var. Hawkeye) were drilled in a clay loam soil on June 9, 1954. A randomized complete block design with four replications was used. The beans had emerged by June 15 and were thinned on June 25. Two row plots (6.6 x 25') were used. Two 20 foot rows were harvested for yield from each plot. The following table shows the average yield for each treatment:

Treatment	Yield bu/A
Full stand (1 bu/A	27.8
3/4 stand (every fourth plant pulled out)	29.1
1/2 stand (every second plant pulled out)	26.7
1/4 stand (every fourth plant left)	24.4
6 in. gaps (every other 6 in. taken out - equivalent to 1/2 stand)	28.1
1 ft. gaps (every other 1 ft. taken out - equivalent to 1/2 stand)	26.0
3 ft. gaps (every other 3 ft. + 1 ft. taken out - equivalent to 1/2 stand)	24.2
5 ft. gaps (every other 5 ft. taken out - equivalent to 1/2 stand)	19.7

Results: The results obtained in 1954 were comparable to those reported in the 1953 research report. There was no difference in yield between the full stand and the 3/4 stand. The 1/2 and 1/4 stands yielded significantly less than the full and the 3/4 stands, but there was no difference between yields of soybeans that were thinned to 1/2 and 1/4 stands. There was no reduction in yield when the beans were thinned by 6-inch and 1-foot gaps, but yield began to drop when large gaps of 3 and 5 feet were left. The soybeans that were thinned by 5-foot gaps yielded significantly less than those that were thinned by 3-foot gaps. When the stand is reduced, many branches run along the ground. Although in the tests these branches were harvested, because the harvesting was done by hand, many of them would not have been harvested if machinery had been used. Consequently the yield from these treatments would have been less than were reported.

These results indicate that when chemical weed-control herbicides are used large reductions in stand may occur without corresponding reductions in yield if the stand is reduced uniformly; but, if long spaces are left with no beans, a reduction in yield can be expected. (Contributed by Department of Agronomy, Agricultural Experiment Station, Urbana, Illinois.)

Post-emergence weed control in late canning peas. Nylund, R. E. Plots of a late variety of canning peas (S-539) planted on Waukegan silt loam on April 22 were sprayed with various herbicides on June 4, at which time the peas were in the 8th to 9th node stage. Yellow-seeded mustard and common millet, which had been seeded to serve as weeds, were at the 8-leaf and 5-leaf stage, respectively, at the time the herbicide was applied. Temperature was 70° F. The following herbicides were applied at a pressure of 30 psi. in 40 gallons of water per acre: TCA, sodium salt, 6 and 8 lb.; MCP, amine, 0.2, 0.3, and 0.5 lb.; 2,4,5 T, ethyl amine, 3 and 6 oz.; CMU, 0.5, 1.0, and 1.5 lb.; dichlorophenyl dimethyl urea (Karmex DW), 0.5, 1.0, and 1.5 lb.; sodium 2, 2, dichloropropionate (Dalapon) at 2,4 and 6 lb.; sodium trichloropropionate, 2,4, and 6 lb.; 2,4,5 trichlorophenoxy propionic acid, amine (Silvex), 3 and 6 oz.; and DNBP, alkanolamine salt, (Premerge), 0.75, 1.0, and 1.25 lb. Each treatment was applied to triplicated single-row plots.

The only treatments that gave significant control of broadleaved annual weeds without seriously injuring peas were MCP at 0.2 and 0.3 lb., 2,4,5 T at 6 oz., and Premerge at 0.75, 1.00, and 1.25 lb. None of the treatments satisfactorily controlled grass without injuring the peas. (Paper No. 3258 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station, University Farm, St. Paul, Minnesota.)

Post-emergence weed control in early canning peas. Nylund, R. E. Triplicated single-row plots of an early variety of canning peas (Alaska C-236 W) planted on a Waukegan silt loam on April 22 were sprayed with various herbicides on May 27, at which time the peas were in the 5th and 6th node stage. The planted weed species, mustard and common millet, were at the 7-leaf and 4-leaf stages, respectively, at the time of spraying. Temperature was 55° F. The following herbicides were applied at a pressure of 30 psi. in 40 gallons of water per acre: TCA, sodium salt, 4, 6, and 8 lb.; MCP, amine salt, 0.2, 0.3, and 0.5 lb.; 2,4,5 T, ethyl amine, 3, 6, and 9 oz.; CMU, 0.5, 1.0, and 1.5 lb.; sodium 2, 2 dichloropropionate (Dalapon), 2,4, and 6 lb.; sodium trichloropropionate, 2, 4, and 6 lb.; DNBP, alkanolamine salt (Premerge), 0.75, 1.00, and 1.25 lb.; 2, 4, 5 trichlorophenoxy propionic acid, amine salt (Silvex), 3, 6, and 9 oz.; and amino triazole, 1 and 2 lb.

Only two herbicides gave fair to good control of broadleaved annual weeds without seriously injuring the peas: 0.3 lb. MCP and 0.75 to 1.25 lb. Premerge. Premerge at 1 and 1.25 lb. also gave fairly good control of grass. None of the other treatments were effective in controlling weeds without seriously injuring peas. (Paper No. 3259 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station, University Farm, St. Paul, Minnesota.)

Pre-emergence weed control in canning peas. Nylund R. E. An early variety (Alaska C-236 W) and a late variety (S-539) of canning peas seeded on April 22 in a Waukegan silt loam soil were sprayed with various herbicides on May 5, four to five days before the peas emerged. The following kinds and acre-rates of herbicides were applied: TCA, sodium salt, 4 and 8 lb.; CMU, 1, 2, and 3 lb.; DNBP, alkanolamine salt (Premerge), 3, 6, and 9 lb.; 2,4 D, propylene glycol butyl ether ester, 1 and 2 lb.; MCP, amine, 1 and 2 lb.; NP (Alanap), 4, 6, and 8 lb.; dichloral urea, 8 and 16 lb.; sodium 2,4,5 trichlorophenoxy ethyl sulphate (Natrin), 3 and 6 lb.; 3-3, 4 dichlorophenyl dimethyl urea (karmex DW), 2 and 3 lb.; 2,4,5, trichlorophenoxy propionic acid, propylene glycol ester, (Kuron), 2 and 3 lbs.; sodium trichlorophenoxy propionate, 5, 10, and 20 lb.; and amino triazole, 4 and 8 lb. Each treatment was applied to single rod-row plots replicated three times.

Only TCA, CMU at 1 lb., DNBP, 2,4 D, MCP, and amino triazole gave significant control of broadleaved annual weeds without excessive damage to the peas. In late peas Kuron also gave satisfactory control without excessive pea damage. None of the herbicides that were applied controlled annual grasses satisfactorily without also excessively damaging the peas. (Paper No. 3250 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station, University Farm, St. Paul, Minnesota.)

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on field peas, Series 1. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of field peas (Pisum spp.) were treated when 2 1/2 inches high with low-volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 2, 3, 4 and 5 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 4 oz/A), amine salt of MCP (Weedar MCP at 2, 3 and 4 oz/A), ethyl ester of

2,4-D (Weedone Concentrate at 2, 3 and 4 oz/A), and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). Special attention was paid to the new herbicide Amizol. The crop was heavily infested with wild mustard (Sinapis arvensis), Russian pigweed (Axyris amaranthoides), and stinkweed (Thlaspe arvense). The soil was clay loam, and the moisture supply was abundant.

Results: The most effective control of weeds was given by Weedone Concentrate, Weedone LV4 and Weedar MCP, followed by ACP-L-601 and Amizol. Dry weight reductions ranged from 76% with 4 oz/A of Weedone Concentrate to 68% with 10 oz/A of Amizol. With all treatments except Amizol, the yield of peas benefited from the weed kill. Peas appeared particularly tolerant to Weedar MCP and ACP-L-601 and the lower rates of Weedone LV4 (yield increase of 55% with 4 oz/A of Weedar MCP), although maturity delays of 5 to 9 days resulted from the treatments. Amizol at all rates caused reductions in the vigor of the peas and maturity delays of 6 to 13 days, and fairly significant yield reductions occurred.

		Crop yield		Weeds			Crop yield		Weeds
Chem.	Rate oz/A	bu/A	% incr.	% loss dry wt.	Chem.	Rate oz/A	bu/A	% incr.	% loss dry wt.
Check		26.7			Check		27.0		
WC	2	33.1	23.9	67.9	Amizol	4	20.8	-23.0	58.4
LV4	2	39.2	46.8	74.6	WC	4	31.3	15.8	76.3
MCP	2	36.2	35.5	88.7	LV4	4	29.1	7.7	67.1
Check		28.0			Check		24.9		
ACP-L-601	2	41.9	49.6	47.9	MCP	4	38.6	55.0	40.4
Amizol	2	26.2	-6.5	56.5	ACP-L-601	4	32.1	28.8	41.4
WC	3	33.6	20.0	72.9	Amizol	6	22.5	-10.0	54.8
Check		26.9			Check		24.2		
LV4	3	33.1	23.0	64.6	ACP-L-601	5	29.6	22.0	83.0
MCP	3	34.3	27.5	60.8	Amizol	8	24.1	-1.0	56.0
ACP-L-601	3	30.0	11.5	47.9	Amizol	10	21.6	-11.0	68.0

Note: WC - ethyl ester of 2,4-D; LV4 - butoxy ethanol ester of 2,4-D; MCP - amine salt of MCP; ACP-L-601 -butoxy ethanol ester of 3,4-D; Amizol - 3, amino 1,2,4-triazole.

(Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on field peas, Series 2. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of field peas (Pisum spp.) were treated when 4 inches high with low-volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 2, 3, 4 and 5 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 4 oz/A), amine salt of MCP (Weedar MCP at 2,3 and 4 oz/A), ethyl ester of 2,4-D (Weedone Concentrate at 2, 3 and 4 oz/A), and 3, amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). Special attention was paid to the new herbicide Amizol. The crop was heavily infested with wild mustard (Sinapis arvensis), Russian pigweed (Axyris amaranthoides), and stinkweed (Thlaspe arvense). The soil was clay loam, and moisture was abundant.

Results: Weed control was most effective with Weedone Concentrate, Weedone LV4, and Weedar MCP, followed by ACP-L-601 and Amizol. Dry weight reductions ranged from 90% with 2 oz/A of Weedone Concentrate to 66% with 10 oz/A of Amizol. Because of the humid weather and resultant succulence of crop growth, all chemicals and rates tended to have a more severe effect on the peas than in previous years. Nearly every treatment caused some reduction in vigor, maturity was delayed from 7 to 19 days, and yield reductions ranging from 0 to 45% occurred. The chemicals, in decreasing order of tolerance to the crop, were Weedar MCP, ACP-L-601, Weedone LV4, Weedone Concentrate, and Amizol.

		Crop yield		Weeds			Crop yield		Weeds
Chem.	Rate oz/A	bu/A	% incr.	% loss dry wt.	Chem	Rate oz/A	bu/A	% incr.	% loss dry wt.
Check		37.7			Check		31.7		
WC	2	31.1	-18.0	90.0	Amizol	4	17.3	-45.0	30.0
LV4	2	31.4	-17.0	74.0	WC	4	28.3	-11.0	74.0
MCP	2	38.0	1.0	76.0	LV4	4	27.6	-13.0	74.0
Check		41.9			Check		30.9		
ACP-L-601	2	39.5	-6.0	82.0	MCP	4	32.1	4.0	62.0
Amizol	2	36.0	-14.0	61.0	ACP-L-601	4	30.6	-1.0	72.0
WC	3	36.7	-13.0	74.0	Amizol	6	21.9	-29.0	35.0
Check		41.5			Check		30.3		
LV4	3	39.3	-6.0	77.0	ACP-L-601	5	30.1	-1.0	80.0
MCP	3	40.5	-3.0	85.0	Amizol	8	22.4	-26.0	64.0
ACP-L-601	3	36.2	-13.0	61.0	Amizol	10	20.6	-32.0	66.0

Note: WC - ethyl ester of 2,4-D; LV4 - butoxy ethanol ester of 2,4-D; MCP - amine salt of MCP; ACP-L-601 - butoxy ethanol ester of 3,4-D; Amizol - 3, amino 1,2,4-triazole.

(Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Effect of 3,4-D, MCP, 2,4-D formulations and Amizol on field peas, Series 3. Pavlychenko, T. K. and Bestrop, A. J. Replicated plots of field peas (Pisum spp.) were treated when 9 to 10 inches high with low-volatile butoxy ethanol esters of 3,4-D (ACP-L-601 at 2, 3, 4 and 5 oz/A) and 2,4-D (Weedone LV4 at 2, 3 and 4 oz/A), amine salt of MCP (Weedar MCP at 2, 3 and 4 oz/A), ethyl ester of 2,4-D (Weedone Concentrate at 2, 3 and 4 oz/A), and 3,amino 1,2,4-triazole (Amizol at 2, 4, 6, 8 and 10 oz/A). Special attention was paid to the new herbicide Amizol. The crop was heavily infested with wild mustard (Sinapis arvensis), Russian pigweed (Axyris amaranthoides), and stinkweed (Thlaspe arvense). The soil was clay loam, and moisture was abundant.

Results: Control was effective with all chemicals and rates, even though the weeds were quite advanced at the time of treatment. Weedone LV4 was most effective, followed by Weedone Concentrate, Amizol, Weedar MCP, and ACP-L-601. Dry weight reductions ranged from 91% with 4 oz/A of Weedone LV4 to 62% with 5 oz/A of ACP-L-601. At this advanced stage of treatment, the peas were very susceptible to all rates and chemicals. The plants suffered extensive epinasty,

from which they never fully recovered, and normal development was delayed so greatly that the fall frosts came before the pods were able to fill. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Chemical control of wild oats and green foxtail in canning peas. Sexsmith, J. J. IPC and CIPC at 4 and 6 lb/A and dichloral urea (DCU) at 5 and 10 lb/A were applied to quadruplicate plot areas 8 x 19 feet and were disked in to a depth of 3 to 4 inches two days prior to seeding, and TCA was applied at 10 and 15 lb/A one day after seeding of Topper canning peas. The whole plot area had been seeded down with wild oats and green foxtail by broadcast seeding and disking three days before drilling of peas. IPC, CIPC, and TCA were applied in 23.2 gallons of water per acre, and DCU in 160 gallons per acre.

Estimated control of wild oats on July 26, immediately before harvest, was 69% and 79% for 4 and 6 lb. IPC; 70% and 71% for 4 and 6 lb. CIPC; 34% and 47% for 5 and 10 lb. DCU; and 6% and 21% for 10 and 15 lb. TCA. Control of green foxtail was rated as poor for all IPC and CIPC treatments, fair plus and good for DCU at 5 and 10 lb, and good to good plus for both rates of TCA. The only chemical causing noticeable effects on peas was DCU, the 5-lb rate causing a reduction in intensity of foliage color, and the 10-lb rate causing very slight stunting and a greenish-yellow color. Neither IPC nor CIPC at 4 or 6 lb. significantly affected shelled-pea yields, although there was a slight reduction from 6 lb. CIPC; both rates of DCU and TCA caused significant yield reduction (Contributed by Canada Department of Agriculture Experimental Station, Lethbridge, Alberta.)

Effect on canning peas of amine 2,4-D and MCP applied at different rates and spray volumes. Sexsmith, J. J. The amines of 2,4-D and MCP were applied to Topper canning peas on June 25, 1954, forty-three days after seeding, at which time the peas were 8 to 10 inches tall. Triplicate treatments of each chemical at rates of 0, 2, 4, and 8 oz/A were applied in water solutions at 6, 12, 23, and 42 gal/A to almost weed-free plots 8 x 19 feet in size. Injury ratings were taken on July 5 at time of first bloom, scores ranging from 0 for no visible injury to 10 for severe curling and stunting (approximately half height) and delayed flowering.

The 4-oz. rate for 2,4-D and MCP respectively scored as follows: 6 gal - 8.0, 1.0; 12 gal - 3.7, .0; 23 gal - 1.3, .3; 42 gal - .7, .0; and for the 8-oz. rate: 6 gal - 10.0, 8.7; 12 gal - 9.3, 4.3; 23 gal - 6.7, 1.3; 42 gal - 1.7, .3. This indicates greater injury from 2,4-D than from MCP, and a decrease in injury with increase in solution volume, as do the yield results.

The 4-oz. rate for 2,4-D and MCP respectively resulted in yields of shelled peas (tons/A) as follows: 6 gal - .28, 1.26; 12 gal - .59, 1.20; 23 gal - 1.03, 1.32; 43 gal - 1.26, 1.20; and the 8-oz. rate gave yields of: 6 gal - .11, .84; 12 gal - .15, 1.10; 23 gal - .34, 1.26; 42 gal - .89, 1.07.

Analysis of tenderometer readings, omitting the 8-oz. rate because of insufficient quantity of peas at lowest volumes, indicated no significant difference in maturity due to chemical, volume, or rate. (Canada Department of Agriculture Experimental Station, Lethbridge, Alberta.)

Forage Legumes

Dayton L. Klingman

Summary

A large number of abstracts on weed control in legumes were submitted, indicating a wide-spread interest. TCA and Dalapon were promising for weedy grass control in alfalfa, sweetclover, and birdsfoot trefoil, but are extremely injurious to lespedeza and the true clovers (ladino, alsike and red). Results with DNBP varied from severe injury to alfalfa stands and no weed control to "most effective treatment used" at some stages of growth. 2,4-D and MCP gave good control of the easy-to-kill broad-leaved weeds with only a moderate amount of injury to alfalfa plants in some areas when applied at rates of 6 ounces or less per acre. In other areas rates of 1/4 pound amine salt gave severe injury to the alfalfa and insufficient control of weeds. 2,4-D and MCP were about equal in the injury to alfalfa. 3,4-D showed some promise, being less toxic to the legumes than 2,4-D or MCP (abstracts entered in section on Spring Sown Grain).

One-half pound amine formulations of 2,4-D and MCP per acre, to weed-free lespedeza at 8 stages of growth, reduced the yields only 10 to 20 percent; the ester of 2,4-D was more injurious; and 2,4,5-T eliminated lespedeza. CIPC, when applied in the fall and worked into the soil, gave good wild oat control with no toxic effects on the spring seeded alfalfa (abstract entered in section on All Annual, Winter Annual and Biennial Weeds). When applied pre-emergence in another experiment, stands of alfalfa were injured, but when applied post-emergence, gave less injury. CIPC controlled smartweed, but gave only fair control of weedy grasses.

In one experiment alfalfa was seeded and treated in 1953 and harvested for hay yields in 1953. There were no significant differences in hay yields as a result of the previous years' treatments, although some of them reduced stands up to 35 percent.

Treatments with TCA, Dalapon, and CIPC for weedy grass control in established alfalfa did not affect yields, and in one experiment giant foxtail was controlled with TCA and with Dalapon. In the northern region the phenoxy compounds gave little injury to established alfalfa, when applied in the early spring in dormant or early growth stages at moderate rates. If the amount of growth of alfalfa was increased, or if rates of treatment were increased, injury resulted.

Abstracts

Effect of Dalapon, TCA and IPC on alfalfa when used to control grasses in alfalfa. Bakke, A. L. Replicated square rod plots were established in an old stand of alfalfa on April 21, when the alfalfa was two inches tall. The following treatments were made: - Dalapon 2, 4, and 6 lbs. per acre, TCA (Sodium Salt) 5 and 10 lbs. per acre and CIPC 4, 8, and 12 lbs. per acre. The temperatures ranged between 50°F. and 60°F. The atmosphere was clear after a rain of 0.8 inch on April 21 and 0.51 inch on April 20. On June 25 a strip was cut through each plot (49.5 sq. ft.) and the green weight determined: Dalapon 2/A-19.7 lbs; 4/A-18.5 lbs; 6/A-18.3 lbs; CIPC 4/A-19.6 lbs; 8/A-19.1 lbs; 12/A-20.9; TCA 5/A-19.8 lbs; 10/A-17.0 lbs; Control 19 lbs. On July 28 the second cutting was made. As there had been no rain during the month along with

high temperatures, the amount of material was much less: Dalapon 2/A-7.7 lbs; 4/A-6.7; 6/A-6.7 lbs; CIPC- 4/A-6.1 lbs; 8/A-5.5 lbs; 12/A-7.4 lbs. TCA (sodium) 5/A-4.8 lbs; 10/A-5.7 lbs. Control 4.7 lbs. There was no significant differences in the different plots as determined by the green weight at the two periods of the growing season. (Iowa Agricultural Experiment Station, Iowa State College.)

Effect of 4-chlorophenoxyacetic acid on established stands of alfalfa, 1954. Bolton, J. L. and R. T. Coupland. A one-year old stand of Ladak alfalfa was treated in triplicate at three stages of development at Saskatoon with 4, 8 and 16 oz. per acre of amine and butoxy ethanol ester of 4-chlorophenoxyacetic acid. The stages of treatment were: May 17 (alfalfa up to 4 in. in height), May 25 (up to 6 in.), and June 3 (up to 9 in.). Notes taken in early July and checked in September showed that no observable damage had occurred from 4 oz. of amine in stage 1. Slight damage (leaf distortion and up to 10% reduction in height) resulted in stage 1 from 8 and 16 oz. of amine and from 4 and 8 oz. of ester, in stage 2 from 4 and 8 oz. of amine and 4 oz. of ester, and in stage 3 from 4 and 8 oz. of amine. Moderate damage (25 to 50% reduction in height) was caused by 16 oz. of ester in stage 1, 16 oz. of amine and 8 and 16 oz. of ester in stage 2, and from 16 oz. of amine and 4 and 8 oz. of ester in stage 3. In stage 3, 16 oz. of ester caused very severe damage (hay yield reduced by 90%). Floral deformation was observed from many treatments, some of which caused no observable damage to foliage. The amine of 4-C was significantly less damaging to vegetative growth than were the amines of 2,4-D and MCP. The butoxy ethanol ester was significantly less damaging than the corresponding formulation of 2,4-D and MCP, but more damaging than 3,4-D. (Contribution of the Dept. of Plant Ecology, University of Saskatchewan and the Forage crops Laboratory, Canada Dept. of Agriculture, Saskatoon, Sask.)

Effect of 2-methyl, 4-chlorophenoxyacetic acid on established stands of alfalfa, 1954. Bolton, J. L. and R. T. Coupland. A one-year old stand of Ladak alfalfa was treated in triplicate at three stages of development at Saskatoon with 4, 8 and 16 oz. per acre of alkanolamine and butoxy ethanol ester of MCP. The stages of treatment were: May 17 (alfalfa up to 4 in. in height), May 25 (up to 6 in.), and June 3 (up to 9 in.). Notes taken in early July and checked in September showed that no or slight damage (not exceeding 10 percent reduction in height) had been caused in stage 1 by 4 and 8 oz. of amine and 4 oz. of ester, and in stage 2 by 4 oz. of amine. Moderate damage (25 to 50% reduction in height) resulted from 16 oz. of amine and 8 oz. of ester in stage 1, from 8 oz. of amine and 4 oz. of ester in stage 2, and 4 oz. of amine in stage 3. Other treatments caused reduction in hay yield of 75 percent or more. The amine was approximately as damaging as the amine of 2,4-D, but much more so than the amine of 4-chlorophenoxyacetic acid. (Contribution of the Forage Crops Laboratory, Canada Dept. of Agriculture and the Dept. of Plant Ecology, University of Saskatchewan, Saskatoon, Sask.)

Relative effect of eight formulations of phenoxy acids on alfalfa, 1954. Coupland, R. T. and J. L. Bolton. A one-year old stand of Ladak alfalfa was treated in triplicate at three stages of development at Saskatoon with 4, 8 and 16 oz. per acre with eight formulations of four phenoxy herbicides. The stages of treatment were: May 17 (alfalfa up to 4 in. in height), May 25 (up to 6 in.), and June 3 (up to 9 in.). The amine of 4-C (4-chlorophenoxyacetic acid) caused least harm to the alfalfa, while that caused by the butoxy ethanol ester of 3,4-D was intermediate between the amine of 4-C and the butoxy ethanol ester of 4-C. Intermediate damage of approximately equal extent was caused by the butoxy ethanol ester of 4-C and the alkanolamines of 2,4-D and MCP. Much more severe

damage of approximately equal extent was caused by the ethyl ester and butoxy ethanol ester of 2,4-D and by the butoxy ethanol ester of MCP. Abnormalities in floral development resulted more frequently from applications of 4-C than from other herbicides. (Contribution of the Dept. of Plant Ecology, University of Saskatchewan and the Forage Crops Laboratory, Canada Dept. of Agriculture, Saskatoon, Sask.)

Effect of 2,4-D on established stands of alfalfa in six stages, 1954. Coupland, R. T. and J. L. Bolton. A one-year old stand of Ladak alfalfa was treated in triplicate at six stages of development at Saskatoon with ethyl ester of 2,4-D. The stages were: May 7 (trace of growth), May 14 (1 to 2 in. high), May 18 (1 to 4 in.), May 25 (up to 7 in. high), June 3 (up to 11 in.), and June 7 (up to 13 in.). Notes were taken from one to two months after treatment and were supplemented by observations in late September. Treatments of 8 and 16 oz. per acre in stage 1 and 4 oz. in stage 2 caused no observable damage except occasional leaf curling. Reductions in height of the crop of 10 to 25% and in forage yield of 25 to 30% were caused by 32, 64 and 128 oz. rates in stage 1, 8 and 16 oz. in stage 2, 4 oz. in stage 3, and 2 oz. in stages 4, 5 and 6. Forty to 50% reduction in height resulted from 8 oz. in stage 3 and 4 oz. in stage 4, but only 60% of the plants appeared to be recovering. Very severe damage occurred from 16 oz. in stage 3, 8 oz. in stage 4, and from 4 and 8 oz. in stages 5 and 6. However, even the latter plots showed considerable recovery by fall. (Contribution of the Dept. of Plant Ecology, University of Saskatchewan and the Forage Crops Laboratory, Canada Dept. of Agriculture, Saskatoon, Sask.)

Relative effect of three formulations of 2,4-D on established stands of alfalfa, 1954. Coupland, R. T. and J. L. Bolton. A one-year old stand of Ladak alfalfa was treated in triplicate at three stages of development at Saskatoon with 4, 8 and 16 oz. per acre of alkanolamine, ethyl ester and butyl ester formulations of 2,4-D. The stages of treatment were: May 17 (alfalfa up to 4 in. in height), May 25 (up to 6 in.), and June 3 (up to 9 in.). Notes taken in early July and checked in September showed that amine at 4 oz. in stage 1 had caused no observable effect on alfalfa. Slight damage (curled leaves and up to 10% reduction in height) was caused in stage 1 by 4 oz. of the esters and 8 oz. of the amine and in stages 2 and 3 by 4 oz. of amine. Moderate damage (25 to 50% reduction in height, 60% or more of plants recovering) was caused in stage 1 by 16 oz. of amine and by 8 and 16 oz. of the esters and in stage 2 by 8 oz. of amine and 4 oz. of the esters. All other treatments caused severe damage. Even the most severely damaged plots had recovered somewhat by fall, but the stand was reduced in density and no flowering occurred. (Contribution of the Dept. of Plant Ecology, University of Saskatchewan and the Forage Crops Laboratory, Canada Dept. of Agriculture, Saskatoon, Sask.)

Effect of 3,4-dichlorophenoxyacetic acid on established stands of alfalfa, 1954. Coupland, R. T. and J. L. Bolton. A one-year old stand of Ladak alfalfa was treated in triplicate at three stages of development at Saskatoon with 4, 8 and 16 oz. per acre of butoxy ethanol ester of 3,4-D. The stages of treatment were: May 17 (alfalfa up to 4 in. in height), May 25 (up to 6 in.), and June 3 (up to 9 in.). Notes taken in early July showed that damage was slight (not exceeding a reduction of 10% in height) from 4, 8 and 16 oz. in stage 1, and from 4 oz. in stages 2 and 3. Moderate damage (up to 50% reduction in height) was caused by the other treatments. The effect of this herbicide on alfalfa was less than was amine, ethyl ester or butoxy ethanol ester of 2,4-D, amine and butoxy ethanol ester of MCP, and the butoxy ethanol ester of 4-chlorophenoxyacetic acid. The amine of 4-chlorophenoxyacetic acid caused less damage. (Contribution of the Dept. of Plant Ecology, University of Saskatchewan and the Forage Crops Laboratory, Canada Dept. of Agriculture, Saskatoon, Sask.)

Effect of various herbicides on Korean lespedeza at different stages of growth. Elder, W. C. and Ed Erickson. Herbicides used were 2,4-D amine, 2,4-D ester, M.C.P. and 2,4,5-T. Rate used of each herbicide was 1/2 lb/A applied in 40 gallons of water. These treatments were made at ten day intervals beginning at the six tri-foliate stage of growth and continuing to the start of the blooming period, making a total of 8 periods. The grass and weeds were removed by cultivation or hoed. Forage yields were taken in the early bloom stage.

Results: 2,4,5-T at 1/2 lb/A rate completely killed all lespedeza plants in all stages of growth. 2,4-D ester was more injurious than the amine type and Korean lespedeza appears to be more tolerant to M.C.P. than to amine 2,4-D. This trend of susceptibility seemed to exist throughout the spray program. The early treatments imparted a dark blue-green color to the leaves and caused the leaves to be very brittle. These conditions were more pronounced in the 2,4-D ester treatments. All the herbicides caused more burning and dropping of the leaves during the later stages of the spray program. Blooming appeared to be reduced by treatments in the advanced stages of growth. Previous tests show clearly that Korean lespedeza is easily killed when small (1 to 2 inches in height) with all the herbicides and rates used in this test. M.C.P. and 2,4-D amine reduced forage production considerably in all stages of growth, however it will be reduced more with a heavy infestation of weeds.

	Pounds/A Korean Lespedeza (dry wt.) Average of 4 reps.				
		1/2 lb/A			
Time of treatment*	Check	M.C.P.	2,4-D amine	2,4-D ester	2,4,5-T ester
1st.	2470	2189	2153	1818	- -
2nd.	2541	2262	2078	1749	- -
3rd.	2579	2265	2153	1949	- -
4th.	2391	2126	2016	1913	- -
5th.	2363	2089	2120	1890	- -
6th.	2508	2275	2248	1936	- -
7th.	2724	2589	2544	2250	- -
8th.	2377	2003	1820	1699	- -

*10 days period between each treatment. 1st. treatment was in six tri-foliate stage. 8th. time was in first bloom stage. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Effect of herbicides on legume seedlings. Forsberg, D. E. In a six replicated test, herbicides were applied to seedlings of Ladak alfalfa, during 1953, in the second true leaf stage. The MCP butyl ester, amine and sodium salt and a 2,4-D amine were sprayed at dosages of 1/8 and 1/4 lb. of acid equivalent/A; the MCP amine was also sprayed at the 3/8 lb/A rate. Also included in this test was DNBP at dosages of 3 qt. in each of 40 and 80 gal. of water/A and 4-chlorophenoxyacetic acid (4-chloro) at rates of 1/8, 1/4, and 1/2 lb/A. In 1954 hay yields were obtained from these plots and the average yield in tons of green weight/A is presented in table 1.

Results:

Table 1. Average hay yields in tons of green weight/A. for alfalfa seeded 1953.

Treatment	Reduction in alf.1953	Yield 1954	Treatment	Reduction in alf.1953	Yield 1954
MCP Na salt 2 oz.	25	.80	Dow selective 3 qt. in 40 gal.	17	.91
MCP Na salt 4 oz.	25	1.07	Dow selective 3 qts. in 80 gal.	17	1.05
MCP amine 2 oz.	22	.82	Sinox W, 3 qts. in 40 gal.	17	1.00
MCP amine 4 oz.	23	.95	Sinox W 3 qts. in 80 gal.	19	1.00
MCP amine 6 oz.	29	.89	ACP 4-chloro 2 oz.	26	.97
MCP butyl ester 2 oz.	35	.92	ACP 4-chloro 4 oz.	27	1.05
MCP butyl ester 4 oz.	33	1.00	ACP 4-chloro 6 oz.	30	.97
2,4-D amine 2 oz.	19	1.12	Check	5	.91
2,4-D amine 4 oz.	23	.89			

LSD (Pat 5% level) - Nil

During the summer of 1954 the precipitation was well above average and growing conditions were very good. However, there was no significant difference in hay yields as a result of the previous year's treatments. Even though there were considerable reductions in alfalfa stand due to treatments in 1953. MCP butyl ester, which reduced the alfalfa stand from 33 to 35%, yielded higher than the check in 1954. This is only one year's results in which growing conditions were good and cannot be too conclusive until more years have been added. (Contribution by the Dominion Experimental Station, Scott, Sask.)

Effect of herbicides on legume seedling. Forsberg, D. E. In a 4 replicated test, herbicides were applied to seedlings of Ladak alfalfa in the second true leaf stage. The MCP butyl ester, amine and sodium salt and a 2,4-D amine were sprayed at dosages of 1/8 and 1/4 lb. of acid equivalent/A; the MCP amine was also sprayed at the 3/8 lb/A. rate. Also included in this test were 3,4-D (ACPL-601) at 1/8, 1/4 and 3/8 lb. acid equivalent/A, 4-chlorophenoxyacetic acid (4-chloro) at rates of 1/2, 1, 2 and 4 lb. acid equivalent/A, and LV-4 at 1/8 and 1/4 lb. acid equivalent/A.

Results:

Table 1. 1954 percent reduction in alfalfa stand.

Treatment	% Reduction	Treatment	% Reduction
3,4-D (ACP L-601) 1/8 lb.	≠ 2	MCP Na salt 1/4 lb.	- 12
3,4-D (ACP L-601) 1/4 lb.	- 24	ACP 4-chloro 1/2 lb.	- 1
3,4-D (ACP L-601) 3/8 lb.	- 17	ACP 4-chloro 1 lb.	- 4
MCP butyl ester 1/8 lb.	- 18	ACP 4-chloro 2 lb.	- 14
MCP butyl ester 1/4 lb.	- 32	ACP 4-chloro 4 lb.	- 15
MCP Amine 1/8 lb.	- 17	LV-4 1/8 lb.	- 6
MCP Amine 1/4 lb.	- 9	LV-4 1/4 lb.	- 39
MCP Amine 3/8 lb.	- 5	2,4-D amine 1/8 lb.	- 6
MCP Na salt 1/8 lb.	≠ 1	2,4-D amine 1/4 lb.	- 5
		Check	≠ 2

Alfalfa plant counts were made before treatment and again on the same location after treatment. The higher rates of MCP butyl ester, 3,4-D (ACP L-601), LV-4 and 2,4-D amine caused thick brittle leaves on the alfalfa seedlings. The lower rates of each chemical, with the exception of MCP butyl ester, did not appear to be too toxic for alfalfa seedlings. (Contribution by the Dominion Experimental Station, Scott, Sask.)

Weed control treatments in birdsfoot trefoil seedlings. Klingman, Dayton L. Birdsfoot trefoil was planted March 25, 1954. CIPC, TCA, DNBP, Dalapon, and 2,4-D plus TCA were applied May 5th when birdsfoot trefoil had up to three trifoliate leaves and the weedy grasses ranged from emerging to the four-leaf stage. Other plots in this experiment were sprayed May 25th with DNBP, Dalapon, and 2,4-D plus Dalapon. By this date birdsfoot trefoil was 4 to 6 inches tall, weedy grasses ranged from 2 to 4 inches tall, and smartweed from 4 to 6 inches tall.

Results: TCA was the most promising herbicide used on birdsfoot trefoil. When applied 6 weeks after planting, 8 lbs./A. gave 87% control of weedy grasses, and 12 lbs., 93%. TCA also greatly reduced the vigor of smartweed. The 8 and 12 lb. TCA treatments by June 24th had stands of birdsfoot of 192% and 89% of the untreated check (7.4 plants per square foot). However, by October 14th, following one of the most severe droughts on record, the birdsfoot trefoil stands were 800% and 745%, respectively, of the check (0.6 plants per square foot), and there was still practically no weedy grass in these plots.

Dalapon at 1½ and 3 lbs./A., applied either 6 or 9 weeks after planting, gave 90% or more weedy grass control, but stands of birdsfoot trefoil were variable, ranging from fair to excellent.

The plots mowed June 8 for weed control had stands of birdsfoot trefoil 225% that of the check by June 24th, and on October 14th stands were 327% of the check. Nevertheless, because of weedy grasses and the dry, hot summer, the stands on mowed plots had decreased till they had less than one-half the stands of the TCA plots. Other treatments in this experiment were not promising in 1954. (Field Crops Research Branch, A.R.S., U.S. Department of Agriculture and Missouri Agricultural Experiment Station.)

Weed control treatments in alfalfa seeding in the spring. Klingman, Dayton L. The weed control treatments as described above for birdsfoot trefoil were applied to alfalfa, seeded March 25, 1954, in an adjoining area. There was a heavy stand of smartweed.

Results: Good to excellent weedy grass control resulted from 1½ and 3 lbs. Dalapon, 8 and 12 lbs. TCA and 3 lbs. DNBP (amine) per acre applied six weeks after planting. Also, good control resulted from 3 lbs. Dalapon applied nine weeks after planting. Acceptable smartweed control resulted from 8 and 10 lbs. CIPC, and 1½ and 3 lbs. DNBP applied six weeks after planting. By June 24, the average number of alfalfa plants per square foot in the more favorable treatments, applied six weeks after planting, were: 8 lbs. TCA, 9.7; 12 lbs. TCA, 13.6; 1½ lb. DNBP, 12.0; 3 lbs. DNBP, 10.7; 8 lbs. CIPC, 10.9; 10 lbs. CIPC, 11.4; 1½ lb. Dalapon, 3.2; and 3 lbs. Dalapon, 6.5. Of the herbicides applied nine weeks after planting, only Dalapon had stands as good as on the mowed plots. The 1½ lb. Dalapon had 5.8 alfalfa plants per square foot; 3 lbs., 8.8. The untreated check had 4.0 alfalfa plants per square foot, and the mowed treatment, 6.1.

By October 19, stands had decreased more in weedy plots than in those having weeds controlled. The plants per square foot in plots treated six weeks after planting were: 8 lbs. TCA, 5.6; 12 lbs. TCA, 6.5; 1½ lb. DNBP, 3.3; 3 lbs. DNBP, 4.2; 1½ lb. Dalapon, 1.8; and 3 lbs. Dalapon, 5.1. The plants in plots treated nine weeks after planting were: 1½ lb. Dalapon, 3.8; and 3 lbs. Dalapon, 7.8. In the untreated check there were 1.3 plants per square foot and in the mowed plots 2.1. (Field Crops Research Branch, A.R.S., U.S. Department of Agriculture and Missouri Agricultural Experiment Station.)

Control of weeds in spring seeded alfalfa. Sand, P. F., McCarty, M. K. and Shafer, N. E. Alfalfa seeded on April 23, 1954 was treated at five stages of growth of the alfalfa with five chemicals. The pre-planting stage with CIPC at 3 and 6 lbs/A. and TCA at 5 and 7 lbs/A., pre-emergence with dalapon at 1, 2, and 4 lbs/A. DNBP 3, 4.5 and 6 lbs/A., TCA at 5 and 7 lbs/A. and silvex ester 2 (2,4,5-trichlorophenoxy) Propionic acid, at 1/4 and 1/2 lbs/A. The other three stages of application were at emergence, one week after emergence and 4 weeks after emergence of the alfalfa. The chemicals and rates were the same for these three stages as for the pre-emergence stage except that DNBP was applied at 1 and 1.5 lbs/A. instead of at the heavier rates used in pre-emergence treatments. Weed seed consisting mainly of yellow foxtail, kochia, and barnyard grass was mixed with the alfalfa making about 10% of the total amount of seed planted. Stand counts were made on June 24 to 29 on alfalfa, grassy weeds, and broad-leaved weeds from 5 eight square foot areas within each plot. Treatments that gave practical control of weedy grasses, mainly foxtails and barnyard grass, were TCA at 5 and 7 pounds per acre and Dalapon at 1, 2 and 4 pounds per acre at the emergence, 1 week after emergence and 4 weeks after emergence stages of growth. Many of the weedy grasses remaining were in a weakened condition especially the one and 4 week after emergence treatments and died later during hot dry weather in July. DNBP and silvex at all rates and stages considerably reduced the stand of alfalfa and gave no control of weeds. Dalapon at 4 pounds per acre at the emergence and 1 week after emergence stages gave some reduction in stand of alfalfa. None of the treatments gave satisfactory control of broad-leaved weeds. Yield tests were made September 1, from most of the treatments that gave good control. The weedy grasses, alfalfa and broad-leaved weeds were separated and weights per acre on the oven dry basis were made under these three categories as shown in the table.

Yields in pounds per acre of grassy weeds and alfalfa and number of plants per 40 sq. ft. of area. Average of four replications.

		Yield of alfalfa in lbs./A.			Stand of alfalfa Plants in 40 sq. ft.			Yield of weedy grasses in lbs./A.			Stand of weedy grasses in plants per 40 sq. ft.		
		September 1			June 24			September 1			June 24		
		Emergence	1 week after emergence	4 wks. after emergence	Emergence	1 week after emergence	4 wks. after emergence	Emergence	1 week after emergence	4 wks. after emergence	Emergence	1 week after emergence	4 wks. after emergence
TCA	5	1412	1340	1280	289	269	350	819	984	1096	54	33	101
	7	1605	1641	1151	267	304	298	599	634	630	26	19	127
Dalapon	1		996	984	307	326	351		2511	1652	122	124	140
	2		884	1214	311	312	317		1475	843	98	87	205
	4		1431	1826	228	257	380		965	390	94	73	166
CK			642			317			1900			284	

According to the yield data the four week after emergence treatment gave best control of grassy weeds. Some grassy weeds probably emerged between the 1 and 4 weeks after emergence treatments. Panicum dichotomiflorum (fall panic) made a heavy growth in some of the plots and accounts for most of the grass in the yield test. However, it was controlled best by the later treatment of dalapon at 2 and 4 lbs/A., and the three dates of treatment of TCA shown in the table. (Contribution of the Department of Agronomy, College of Agriculture and Field Crops Research Branch, A.R.S. and the Nebraska Agricultural Experiment Station Cooperating.)

The effect of TCA and Dalapon on annual grasses in seedling legumes. Bondarenko, D. D., Slife, F. W. Seeds of 7 different legumes were planted on March 10, 1954 to test their tolerance to various rates of TCA and Dalapon. Legumes planted were alfalfa, red clover, sweetclover, alsike clover, ladino clover, birdsfoot trefoil, and annual lespedeza. Treatments were made on May 6, 1954, when the legumes were approximately 3 inches in height. Chemicals and rates used were: TCA at 3, 6, and 9 lbs. of acid per acre, and Dalapon at 2, 4, and 6 lbs. of acid per acre. Results in terms of injury to the legume seedlings are given below. 0 = no effect, 10 = complete kill.

	TCA			Dalapon		
	3	6	9	2	4	6
Alfalfa	0	0	3	0	2	2
Red clover	2	4	8	8	10	10
Sweetclover	0	1	2	2	4	8
Alsike	4	8	10	8	10	10
Ladino	3	6	8	3	7	8
Birdsfoot trefoil	0	1	1	0	0	1
Lespedeza	2	4	5	2	5	5

Dalapon at the rates used had no permanent effects on alfalfa or birdsfoot trefoil while it injured other legumes severely. TCA had little effect on sweetclover and birdsfoot trefoil and did not injure alfalfa too severely at the 9-lb. rate. At the time of spraying, several weed species were beginning to germinate. Yellow and green foxtail, Setaria spp, and pigweed, Amaranthus spp, were particularly prevalent. The 4- and 6-lb. rate of Dalapon gave excellent control of foxtails and some reduction in stand of pigweed. The 2-lb. rate reduced the foxtail stand slightly. The 9-lb. rate of TCA gave excellent control of foxtail with slight reduction in stand of pigweed. The 6-lb. rate of TCA reduced the foxtail stand by 50% with no effect on pigweed. The 3-lb. rate of TCA was ineffective on either species. (Contribution of the Illinois Agricultural Experiment Station.)

The effect of various rates of TCA and Dalapon on Setaria faberii grown in established alfalfa. Slife, F. W. Setaria faberii is a serious weed in established alfalfa fields. Although this weed starts germinating by mid-April, it does not offer competition to the alfalfa until the first crop of hay is removed. After that time, the foxtail grows as fast as the alfalfa, with the result that the 2nd and 3rd hay crops are thoroughly infested.

TCA at 6, 12, and 18 lbs. of acid per acre and Dalapon at 3, 6, and 9 lbs. of acid per acre were applied to 2nd-year alfalfa on April 22, when the alfalfa was approximately 8 inches tall. Complete kills of foxtail resulted with the two heavier rates of each chemical, while the light rates controlled 50% of the foxtail. Alfalfa-hay yields were normal as compared to the check plots at the two lighter rates of each chemical, but were reduced by 25% at the heavier rate of each chemical. This trend in hay yields was true for all three cuttings of alfalfa. After the 1st cutting, TCA at 10, 15, and 20 lbs. per acre and Dalapon at 5, 7½, and 10 lbs. per acre were applied to the stubble. There was no effect on hay yields at the next 2 cuttings, and giant foxtail was completely eliminated on all plots. The same rates of the same chemicals were applied after the 2nd cutting and again there was no difference in yield of alfalfa at the 3rd cutting date. Giant foxtail was controlled very well at the heavy rate of each chemical, approximately 85% at the intermediate rate, and approximately 50% at the light rate of each chemical. (Contribution of the Illinois Agricultural Experiment Station.)

Effect of 2,4-D and MCP on seedling alfalfa and sweetclover. Brown, D. A. Test A. Thick vigorous stands of legumes, seeded in May 1953 without a nurse crop, were used. Treatments. - (1) 2,4-D ester L.V.4. (2) MCP ester Methoxone 5. (3) MCP amine (4) MCP sodium salt. All chemicals were applied at equal rates of 2, 4 and 6 oz. acid/ac. at four stages in height of the legume plants namely: 1½, 3, 5, and 7 inches. Notes recorded in 1953 showed alfalfa to be less sensitive to treatments than sweetclover. Injury, however, was only severe on alfalfa plots treated with 2,4-D L.V.4 ester at both rates when the crop was 5 to 7 inches high. A similar trend in the stage when injury was most apparent was obvious throughout the MCP formulations but to a much lesser extent than with the 2,4-D ester. Sweetclover gave a corresponding response as to stage of growth and comparative effect of chemicals but injury to the clover was more pronounced. Yields of hay were taken in 1954. In alfalfa the only treatments giving yields significantly lower than checks were: 2,4-D L.V.4 ester at all three rates applied when plants were 7 inches high, MCP ester at 4 oz. rate and MCP amine at 6 oz. rate at the 7 inch height. In sweetclover yields significantly lower than checks resulted from 2,4-D L.V.4 ester at 4 oz. rate applied when plants were 5 inches high and at all rates applied at the 7 inch height. Injury of lesser extent resulted from the 4 and 6 oz. rates of MCP ester and the 6 oz. rate of sodium salt at the 7 inch stage.

Test B. A nurse crop of oats was used for the 1954 experiments. Treatments included standard esters of 2,4-D and MCP at rates of 2 and 4 oz. acid/ac.; amines at 3 and 5 oz. and sodium salts at 4 and 6 oz. applications were made when the legumes were at heights of 1½. and 4½ inches. Alfalfa made a thick vigorous stand prior to spraying. Sweetclover sustained damage from weevil. This pest was controlled with dieldrin, but the crop was at a disadvantage compared with alfalfa. At the end of the growing season stands of legumes on the treated plots were estimated in per cent of the stands on checks. Results summarized: - (1) 2,4-D ester at both rates inflicted the highest percentage damage to both legumes, MCP ester came next, sodium salts third and amines gave the least injurious effect. (2) Esters of both 2,4-D and MCP damaged alfalfa more at the 4½ inch stage than the earlier stage. Amines and sodium salts gave closely comparable results at both growth stages. In sweetclover esters were equally severe at both stages of growth but amines and sodium salts inflicted most damage at the 1½ inch stage. (3) Sweetclover appeared more sensitive to the chemicals than alfalfa. The only reasonably safe treatments for clover in 1954 were the lower rates of amines and sodium salts. (4) Seeding with or without a nurse crop appears to exert a strong influence on the efficacy of treating seedling alfalfa and sweetclover with 2,4-D and MCP. Dense strong stands of legume sustain much less damage than thinner weaker stands especially when these latter are competing with a companion crop of grain. Thick vigorous stands can be thinned up to 25 per cent during the first year and not appreciably lower the yield of hay in the succeeding year. (5) On the basis of four years' work at Brandon it would seem possible to treat safely newly seeded fields of alfalfa when plants are 1½ to 3 inches high with amines and sodium salts of 2,4-D or MCP at rates up to 5 oz. acid/ac. Sweetclover seedlings should not be treated unless the stand is particularly good and when weed infestation consists mainly of species most sensitive to the chemical. (Contribution of Experimental Farm, Brandon, Manitoba.)

Chemical control of weeds in fields newly seeded to alfalfa and sweetclover. Brown, D. A. Plots used in 1954 to test the influence of 2,4-D and MCP on alfalfa and sweetclover were moderately infested with the following weeds, - stinkweed, lambs quarters, red root pigweed, grey tansy, mustard, wild buckwheat, portulaca, Russian thistle, cut-leaved nightshade, golden corydalis, pepper grass and perennial sow-thistle. Treatments were: - 2 and 4 oz. acid/ac. of 2,4-D and MCP esters, 3 and 5 oz. rates of amines and 4 and 6 oz. rates of sodium salts of both 2,4-D and MCP. Weed counts were made before and after treatments. Percentage control was calculated. Results: - Excellent control of stinkweed and lambs quarters was obtained with both rates of the esters and the higher rates of amines and sodium salts but only medium control at the lower rates of the latter two formulations. Best control of red root pigweed was obtained with 4 oz. of 2,4-D ester, next the 4 oz. rate of MCP ester. The 5 oz. rate of MCP amine gave fair to good control. All other rates of amines and sodium salts gave only fair to poor control. Control of grey tansy mustard followed the same pattern as red root pigweed. Common buckwheat and Russian thistle were moderately controlled only by the highest rates of esters particularly that of 2,4-D. Portulaca (early seedling stage) was well controlled by the 4 oz. rate of esters of both chemicals and moderately well controlled by 5 oz. amines and 6 oz. sodium salts. Cut-leaved night shade required the heavier applications of esters to exert even a small measure of control. Golden corydalis was readily killed back by all treatments but regrowth was quickly established. Perennial sowthistle was only satisfactorily killed back by the heavier applications of esters. There appeared little difference in the action of 2,4-D compared with MCP. In general the ester of 2,4-D was slightly more effective than any other formulation. There was evidence to indicate that

weeds sensitive to 2,4-D and MCP can be successfully controlled in newly seeded fields of alfalfa with applications of 2 oz. acid/ac. of esters and up to 5 oz. acid/ac. of amines and sodium salts. Chemical control of weeds in sweetclover, except those most readily killed, appeared doubtful since the degree of sensitivity of the clover agrees closely with that of such common weeds as red root pigweed, pepper grass, shepherd's purse and mustards such as tansy.
(Contribution of the Experimental Farm, Brandon, Manitoba.)

HERBACEOUS WEEDS IN PASTURES AND MEADOWS

M. K. McCarty

Summary

From number of reports received this year and previously, it appears that few experiments are in progress relative to control of herbaceous weeds in pastures and meadows. Much more information is needed as to control methods and resulting benefits as measured by production and quality of forage.

An experiment in its 5th year at Lincoln, Nebraska compares plowing and reseeding to adapted grasses (plus 2,4-D), spraying with 2,4-D at two dates and mowing at two dates. The best control was with plowing and reseeding (plus 2,4-D) followed by the two spraying treatments using 2,4-D. Mowing was much less effective except with a few annuals. The early mowing date did give reasonably good control on hairy chess. Both production and basal density of desirable grasses increased where treatments reduced the broad-leaved weeds.

In a study comparing dates of treatment for mowing, 1 lb/A 2,4-D amine and 1 lb/A 2,4-D isopropyl ester on ironweed (Vernonia baldwinii, Torr.) for 8 dates from June 5 to August 14, the early dates gave best results for all three methods. Mowing at the two best dates gave 1/3 control and 1/5 or less at all other dates over a 4 year period. The ester gave good control for more dates than the amine with only slightly more effectiveness during June when both averaged close to 90% control.

Two abstracts were received reporting use of chemical grass killers as an aid to pasture establishment. In one experiment 40 lbs. TCA, 20 lbs. dalapon, 30 lbs. CIPC, 60 lbs. ammate and 80 lbs. atlacide were used alone and at 1/2 rates combined with light tillage on an old bluegrass sod. Dalapon and TCA effectively killed the sod at the heavy rates and at 1/2 rates plus light tillage. Trefoil and alfalfa were seeded with trefoil reported as more tolerant to TCA and dalapon than alfalfa. A half rate of chemical plus light tillage was equal to the heavy rate alone. Stands and yield were not reported. In a second experiment 2.5, 5 and 10 lbs. dalapon; 10, 20 and 40 lbs. TCA; and 3, 6 and 12 lbs. MH were used on a bluegrass sod containing some timothy and quackgrass. Chemical plots were split with seedbed preparation and seedings made with alfalfa and trefoil. Differential response was noted.

Abstracts of Contributors

A comparison of weed control methods in a weedy farm pasture. McCarty, M. K. An experiment comparing (1) mowing, (2) 1 lb. 2,4-D per acre, (3) plowing and reseeding to grass (Plus 2,4-D) and (4) check, in a weedy farm pasture has been under way since 1950. 1/ Evaluation of results was made in the spring of 1954 prior to 1954 treatments. Stem counts of all species in permanently located quadrats were made. A few of the individual species and their reaction to treatment are given in the following table.

Treatments	Percentage of check stands							
	Ironweed %	False Boneset %	Hoary Vervain %	Yarrow %	Many Flowered Aster %	Annual Ragweed %	4 Annual Species %	All Perennial Species %
Check	100	100	100	100	100	100	100	100
Mowed early June	60	98	72	235	46	180	177	117
Mowed early July	89	80	56	80	30	67	67	96
2,4-D early June *	5	102	116	69	0	68	71	55
2,4-D early July *	15	54	67	41	0	44	45	38
Intermediate wheatgrass **	1	16	4	243	0	33	30	22
Bromegrass **	1	11	7	59	0	25	17	21
Warm-season grass mixture **	1	9	24	259	0	8	7	28

* 1 lb/A 2,4-D isopropyl ester.
** Plus 1 lb/A 2,4-D isopropyl ester.

Actual control of several of these species is much better than the table indicates as these counts include current years seedlings. Ironweed shows that 4 years of mowing in early June has only resulted in a 40% reduction in stand and the July date only 11% reduction whereas the 2,4-D at the same dates has given 95% and 85% reduction in stand respectively. Numbers of dandelion and annual ragweed have increased under the early June mowing date as compared to check. Mowing has been relatively ineffective on all species except hairy chess where it gave 87% control at the early date. Basal density of desirable grasses increased with both types of weed control treatment with the mowed plots showing an average 18% increase and the sprayed an average 33% increase over check. 1/ Experiment set up and carried through 1952 by Dr. D. L. Klingman, Section of Weed Investigation, A.R.S., now at Columbia, Missouri. (Contribution of the Field Crops Research Branch, A.R.S. and the Nebraska Agricultural Experiment Station cooperating. Approved for publication.)

Effect of mowing and spraying with 2,4-D at eight different dates on ironweed (Vernonia baldwinii, Torr.). McCarty, M. K. Plots 10 x 50' in 3 replications were established in a weedy pasture south of Lincoln, Nebraska in 1950. 1/ A similar experiment was laid out in 1951. Mowing and spraying with 1 lb. 2,4-D amine salt and isopropyl ester were compared at eight dates. The following table shows results obtained in both experiments, one reflecting 4 years of treatment and the other 3 years of treatment.

Treatment	Percent reduction in stand of ironweed.							
	June 5 %	June 12 %	June 19 %	June 26 %	July 3 %	July 17 %	July 31 %	August 14 %
4 years treatment								
Mow	18	36	35	21	21	11	3	7
2,4-D ester	94	91	89	87	93	88	51	73
2,4-D Amine	91	75	88	89	60	72	10	45
3 years treatment								
Mow	20	13	16	8	5	4	8	5
2,4-D ester	84	69	67	63	72	76	21	29
2,4-D Amine	85	43	43	71	38	70	22	25

Four consecutive years of mowing have given only 1/3 control at the best dates and essentially no control at the later dates. The 2,4-D ester treatment has given good results over a wider range of dates where applied for 4 years but for a lesser number of applications shows more effectiveness at the earlier dates. The ester formulation appears to be more effective than amine salt at all dates. Check plots were included for a comparison at each date. Mowing resulted in an increase in the dandelion population as compared to check. Both spraying treatments were effective in reducing dandelion, with the earlier dates again the best. 1/ Experiment set up and carried through 1952 by Dr. D. L. Klingman, Section of Weed Investigations, ARS, now at Columbia, Missouri. (Contribution of the Field Crops Research Branch, A.R.S. and the Nebraska Agricultural Experiment Station cooperating. Approved for publication.)

Chemical grass killers shortly before seeding for pasture establishment. Churchill, B. R. and Tesar, M. B. A Kentucky bluegrass sod with considerable timothy and some quackgrass was sprayed April 23 with dalapon 2.5, 5, and 10 lbs., TCA 10, 20, and 40 lbs., and maleic hydrazide 3, 6, and 12 lbs. per acre. On May 7 part of each plot was plowed shallow and fitted. On May 8 the fitted and unfitted areas of all plots were seeded to alfalfa and birdsfoot trefoil. October readings showed maleic hydrazide had not killed the grass, however, observation in early summer indicated that growth had been slowed down. Grass was killed by both dalapon and TCA the best kill being at the highest rates. In the plowed and fitted area trefoil stands were excellent for all treatments. In the same area alfalfa stands were good in plots treated with maleic hydrazide but ranged from fair to very poor with the other two chemicals. Very thick stands of volunteer white clover were present on all dalapon treated plots and ranged from very thick to zero on TCA treated plots. On the unplowed area alfalfa failed in all cases but excellent stands of trefoil resulted where the sod was killed. (Michigan Agricultural Experiment Station, East Lansing, Michigan).

Chemical grass killers as an aid to pasture establishment. Tesar, M. B. and Churchill, B. R. TCA 40 lbs., dalapon 20 lbs., C-IPC 30 lbs., ammate 60 lbs. and atlacide 80 lbs., per acre were used alone and at one half these rates in combination with light tillage as both fall and spring treatments on an old predominately bluegrass sod. These treatments were compared with heavy tillage and plowing. All plots were fitted just before seeding alfalfa and birdsfoot trefoil. Spring seedings were made on fall treated plots and early August seedings were made on the spring treated plots. Dalapon and TCA were both very effective in killing the grass. A half rate of chemical plus light tillage was equal to the heavy rate of chemical alone. Trefoil was much more tolerant to both Dalapon and TCA than was alfalfa. Stand counts have been made but not tabulated. Yields will be taken in 1955. (Michigan Agricultural Experiment Station, East Lansing, Michigan).

Sugar Beets

Summary

B. H. Grigsby

A total of 5 abstracts was received in which pre-planting, pre-emergence and post emergence application of chemicals were described. In this season most of the experiments dealt with IPC, TCA, DCU, CMU and dalapon. CIPC and other carbonates, as well as some urea derivatives were reported by certain investigators.

The chemicals used and the results reported indicate that the control of grasses, especially wild oats and foxtail are the chief weeds in most of the region where sugar beets are grown. In the eastern part of this region, broad-leaved weeds were considered but relatively poor results were reported.

In Alberta and North Dakota effective control of wild oats was obtained by pre-planting applications of IPC at rates of 6, 8, 12, and 18 lb/A. The rates used in Colorado were below 6 lb. and poor results were reported, possibly because of severe drought conditions. In the North Dakota report, a combination of TCA and IPC, each at 6 lb/A, gave best control of wild oats and had the least effect on beet stands.

TCA, applied at 5-10 lb/A as a pre-emergence treatment generally gave excellent control of foxtail. This compound also controlled up to 50% of the broad-leaved weeds when applied as a post-emergence treatment to beets in the 4 leaf stage.

DCU at 5-12 lb/A and Dalapon at 3-6lb/A, were reported to give control of annual grasses either as pre-emergence treatments or as post emergence applications when beets had 4-8 leaves. Some injury to beets was observed when beets were in the 8-leaf stage.

In one report, Natrin, CMU and other urea derivatives, and various carbamates were not effective on weeds at the rates used and produced a temporary stunting of beets. Stunting from higher rates of carbamates was noted in some of the other reports.

The results obtained in 1954 are not essentially different from the data reported in previous years. Dalapon is the only new compound which shows any promise in sugar beet weed control, but the data are too limited to warrant any suggestions for grower usage. In view of several observations of stunting, it appears that attention should be given to the collection of adequate yield data from all trials made upon sugar beets. Any disturbance in the growth of beets can lead to a reduction in sugar production and to changes in the purity of the product. These are important matters to sugar beet growers and must be considered before recommendations for weed control practices are made.

Abstracts

Fall pre-planting treatments with IPC and TCA for control of wild oats (Avena fatua) in sugar beets. Andersen, Robert N. and Helgeson, E. A. Randomized duplicate plots 32 ft. sq. were laid out on a Fargo clay soil known to be naturally infested with wild oats. The materials shown in the following table were applied in 20 gal. of aqueous mixture/A on October 17, 1953. The

plots were immediately disked twice to a depth of 4 to 5 in. The area was planted to sugar beets in the spring of 1954. On June 12, 1954, numbers of wild oat and sugar beet seedlings were as shown in the table.

Treatment	Number of plants/26 ft. of row	
	Wild Oats	Sugar Beets
Check	56.0	72.5
IPC 8 lb/A	7.0	68.5
IPC 12 lb/A	10.5	61.5
IPC 18 lb/A	5.0	65.5
TCA 8 lb/A	6.5	46.0
TCA 12 lb/A	1.5	57.0
TCA 18 lb/A	7.5	45.0
IPC 6 lb/A + TCA 6 lb/A	0.0	64.5
IPC 9 lb/A + TCA 9 lb/A	0.5	87.5

Yields were not secured but no apparent treatment effects were noted at mid-season. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N.D.

Effect of post-emergent applications of Dalapon to weed free sugar beets. Andersen, Robert N. and Helgeson, E. A. Plots 4 rows by 24 ft. in length were laid out on a field of sugar beets in a Fargo clay soil. A split plot design with four replications was employed. Time of application were main plots and rates of the sodium salt of 22 dichloropropionic acid (Dalapon) were sub-plots. The material was applied in 40 gal. of aqueous solution/A at the stages of growth indicated in the table. Two 20 ft. lengths of row per plot were harvested September 25, 1954. Uncontrollable circumstances resulted in the loss of considerable data and made statistical analysis impossible. Hence, the data shown in the following table are the averages of 3 plots in some cases and 4 plots in others. The figures for the check are the averages of 5 plots. Rates of Dalapon are in terms of the acid equiv.

Treatment	2 leaf stage May 30		2-5 leaf stage June 4		8-12 leaf stage June 12		16-24 leaf stage July 5	
	yield T/A	sugar %	yield T/A	sugar %	yield T/A	sugar %	yield T/A	sugar %
Check	17.69	15.45	17.69	15.45	17.69	15.45	-	-
Dalapon 4 lb/A	-	-	-	-	16.72	15.12	-	-
Dalapon 6 lb/A	16.26	15.55	-	-	15.71	14.65	-	-
Dalapon 8 lb/A	-	-	16.60	15.34	16.35	15.25	13.50	14.56

Reductions in yield are indicated. Whether or not these reductions could be offset by benefits of weed control needs further study. Data of the authors elsewhere in this report indicate that rates of Dalapon in the order 4 to 6 lb/A gave very good control of wild oats in post-emergence applications. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N.D.

Pre- and post-emergence herbicides on sugar beets. Ilnicki, R. D. and Willard, C. J. Triplicated 4-row plots 25 feet long were laid out at the Northwest Substation, O.A.E.S., Hoytville, Ohio. Beets were planted on May 8 with rape and millet to simulate weeds. The following were applied pre-emergence on May 12 and 13: STCA at 5, 7½, 10, and 15 lb/A; Endothal at 4, 8, and 12 lb; STCA 4 lb. plus Endothal 2 lb; TCA 5 lb. plus sodium PCP 2 lb; Isopropyl N-(3-methylphenyl)-carbamate (T-516) at 2, 4, 8, and 10 lb; sodium 2,2-dichloropropionate (Dalapon) and EH6249 each at 1½, 3, 4½, and 6 lb; sodium 2, 4, 5-trichlorophenoxyethyl sulfate (Natrin) at 1½ and 3 lb; CMU and 3-(3,4-dichlorophenyl)-1,1-dimethylurea (Karmex DW) each at ½ and 1 lb; and dichloral urea at 5, 10, and 15 lb. The following were applied on May 30 (4 leaves): Dalapon at 2, 3, 4 and 5 lb/A; TCA at 5, 7½, and 10 lb; EH6249 at 3 and 4 lb: and on June 8 (6 to 7 leaves): Dalapon 3, 4, and 5 lb; TCA at 5 and 7½ lb; and EH6249 at 4 lb. All rates are expressed as active ingredient per acre; all applied in 40 gallons spray per acre. There was a check plot next each treated plot. Pre-emergence Dalapon at 3 lb. and TCA 5 lb. gave 96% and 92% control of grasses with no effect on broad-leaves. At higher rates, no broadleaf control at any rate for Dalapon, almost 50% control for TCA at 10 lb. Dalapon at 5 lb. stunted beets, but the effect was later outgrown. EH6249 was less effective than Dalapon; no control of broadleaves. Endothal was only effective on grass, the high rate gave almost 80% control. DCU effective on grass only, the 5 lb. rate giving almost 90% control. T-516 was ineffective, the highest rate giving only 70% and 60% control of grass and broadleaves, respectively. Natrin, CMU, and Karmex DW were ineffective on weeds at rates used; both rates of Natrin and CMU, 1 lb. stunted beets for short time. TCA was more toxic to beets than Dalapon on May 30. Dalapon 2 lb. and TCA 5 lb. gave 92% and 95% control of grass, respectively, TCA was more effective on broadleaves than Dalapon. EH6249 gave 92% control of grass and 25% control of broadleaves at the 4 lb. rate. On June 8, Dalapon was more toxic to beets and broadleaves and more effective on grasses than TCA. Dalapon 3 lb. and TCA 4 lb. gave 90% control of grass, higher rates still more effective. EH6249 at the 4 lb. rate was not too effective on grass and had no effect on broadleaves. (Contribution of the Ohio Agricultural Experiment Station.)

Observations on IPC, TCA, DCU and Dalapon for weed control in sugar beets - 1954. Nelson, Russell T. Herbicides IPC and TCA were used commercially again in some areas in which The Great Western Sugar Company operates. The IPC was used in the same manner as a year ago, namely, as a pre-planting soil-incorporation treatment for wild oat and volunteer grain control. The rate of IPC was 3 lb/A. The TCA was used at about 5 lb/A as a pre-emergence treatment for control of foxtail grass (Setaria). Results from the use of IPC in 1954 were poorer than during the 1952 and 1953 seasons. This for the most part is directly attributable to the severe drought and lack of irrigation water in southern Wyoming and northern Colorado. However, some IPC was used in Montana under very wet cold conditions with poor results, also. It is likely higher rates of IPC are going to be required for adequate control under prolonged slow growing conditions which are more commonly associated with early treatment in the northern areas. The TCA was used for control of foxtail grass in central Nebraska and southern Montana with variable but generally favorable results.

Trials with DCU were made on several fields in northern Colorado. Enough volunteer barley occurred in two fields for evaluation of control. DCU applied at 5.8 and 11.4 lb/A as a pre-planting pre-discing treatment in portions of one field gave control of barley without injury to sugar beets. In the other field foul with barley in which DCU applications were not made until after beets were planted and barley had already emerged results were unsatisfactory. Four fields treated with DCU at 7.3 to 14.4 lb/A as a pre-planting soil-incorporation treatment showed good control of foxtail grass without injury to sugar beets. The latter is in agreement with results of 1953.

Dalapon was tested and observed by the writer in 17 fields located in northern Colorado and western Nebraska. Dalapon was applied in a band over the beet row at the rates 3.4 and 6.8 lb/A. In each test TCA was applied in the same manner at rates of 4 and 8 lb/A. Applications were made in late May or early June for the control of foxtail grass. At the time of spraying beets were in the 4 to 8 leaf stage and grass blades were 1 to 3 inches long. The results with Dalapon at rates given and TCA at rates given were nearly equal. However, there were three tests in which Dalapon on visual evaluation caused more injury to beets than TCA. Observations were made five weeks after applications. (Contribution of The Great Western Sugar Company, Agr. Experiment Station, Longmont, Colorado.)

Chemical control of wild oats and green foxtail in sugar beets. Sexsmith, J. J. IPC and CIPC at 4 and 6 lb/A and dichloral urea (DCU) at 5 and 10 lb/A were applied to quadruplicate plot areas 8 x 19 ft. and disked in to a depth of 3-4 inches two days prior to seedling, and TCA at 10 and 15 lb/A was applied one day after seeding of Alta SP 12 sugar beets. The whole plot area had been broadcast seeded with wild oats and green foxtail and thoroughly disked three days before the drilling of beets. IPC, CIPC, and TCA were applied in 23.2 gal/A of water, and DCU in 160 gal/A. Wild oat control estimates for the treatments were 69% and 79% for 4 and 6 lb IPC; 70% and 71% for 4 and 6 lb CIPC; 34% and 47% for 5 and 10 lb DCU; and 6% and 21% for 10 and 15 lb TCA. Control of green foxtail was rated as poor for all IPC and CIPC treatments, fair+ and good for DCU at 5 and 10 lb, and good to good+ for both rates of TCA. No noticeable effects of the treatments were seen in the thin stand of beets in the early part of season. Reasonably uniform stands, ranging between 80% and 90% of possible, were obtained after late hand weeding and thinning. Significant yield increases were obtained from IPC at 6 lb and CIPC at 4 lb. Such increases indicate a beneficial effect of treatments as a result of decreased competition from wild oats prior to thinning. Possible injury to beets by 6 lb CIPC is indicated by the fact that no significant yield increase was obtained from this treatment. Neither of the two rates of DCU and TCA affected beet yields, indicating no injurious effect of chemicals to beets and insufficient degree of weed control. (Canada Dept. of Agriculture Experimental Station, Lethbridge, Alberta.)

Turf

Summary

B. H. Grigsby

Of the five abstracts received, three dealt with the control of crabgrass, one with control of clover and one with the tolerance of various grasses to some of the newer herbicides.

The crabgrass trials were chiefly directed toward control by pre-emergence applications, however, some tests of post emergence herbicides were reported. In one report the chemicals were applied as both pre- and post emergence treatments.

The chemicals, SES, sesin, natrin, NP, DCU, chlordane and lead arsenate were used for pre-emergence trials. For post emergence control, PMA, dry and liquid formulations, KOCN, crabgrass spray oil, and chlordane were used.

The data show that all of the pre-emergence treatments reduced the number of crabgrass plants by fifty percent or more. The most effective compounds, NP and DCU, produced some discoloration of bluegrass but did not cause permanent damage. However, SES did not discolor the turf and gave satisfactory control. Results with sesin at 4-6 lb/A were not uniform but were reported as satisfactory when moisture adequate to promote seed germination was available.

Post emergence applications of PMA and KOCN generally gave satisfactory control of crabgrass but some discoloration was noted.

The report on tolerance of turf to herbicides indicates that Dalapon at 10 and 20 lb/A, Aminotriazole at 1.5, 3 and 6 lb/A, and 3 formulations of CMU at 20 and 40 lb/A may give temporary suppression of perennial grasses but these rates are not sufficient for a permanent kill of turf.

Control of clover in turf was reported by the use of endothal and Kuron, at rates of 2 lb/A. The latter herbicide was also effective on a number of broad-leaved weeds. Reasonable tolerance of bent grass for these herbicides was indicated.

On the basis of work reported in 1954, crabgrass control appears to be the major turf weed problem in the area. Further work, especially in the use of post emergence herbicides, is needed and information on the response of turf grasses other than Kentucky bluegrass is essential.

These data confirm the fact that pre-emergence control of crabgrass is possible in turf and that a number of herbicides may accomplish this result. However, it should be noted that this method of control is difficult for the average home owner, and poor results may be expected from recommendations of this method. Calendar dates for first applications are hard to establish and the long period in which germinations occur may lead to crabgrass infestation lots in the season.

Abstracts

Control of clover in bent grass turf. B. H. Grigsby. Endothal, TCA, and Kuran, all at the rate of 2 lb/A were applied for the control of red clover and white clover in three strains of bent grasses, Kentucky bluegrass and annual bluegrass. Sprays were applied on July 9 and fourteen days later all white clover was dead in the endothal plots. After twenty-one days both white and red clover were dead in the Kuron plots. TCA, at the rate used, had no effect on either type of clover. Some temporary discoloration of bent grass was observed in the Kuron plots but full recovery occurred in four weeks. (Contribution from the Michigan Agricultural Experiment Station.)

Crabgrass control trials in 1954. H. L. Lantz. The crabgrass trials were located on a fairway of a local golf course. Sixty-four plots, 6 x 55 feet were used to determine whether pre-emergence treatments would inhibit crabgrass germination and to compare these treatments with post emergence application of mercuric acetate and potassium cyanate.

Treatments were made on June 4, 29, and July 29. Crabgrass counts were made on September 1 - 6. Precipitation was abundant in the spring months but ended on June 20. Above normal temperatures with no rainfall prevailed until August 14. Abundant rain after August 14 was followed by considerable germination of crabgrass seed.

The herbicides used and evaluation of treatments are as follows:

Check plots--7-50 crabgrass plants per sq. ft. typical purple color and seeding profusely.

SES--Sprayed June 4, 29 and July 29 at rates of 4, 6 and 8 lb/A. Plots which received three sprayings averaged .6 crabgrass plants per sq. ft., while those sprayed June 4 only had five crabgrass plants. Bluegrass was not injured by any treatment.

DCU--Sprayed June 4 at rates of 9.9 and 14.8 lb/A. Complete control of crabgrass. Bluegrass showed inhibition in growth and dark blue-green color for sixty days, but had recovered by the end of the growing season.

Sesin--Applied dry with five lbs. milorganite at rates of 8 and 12 lb/A.

Natrin--Applied like Sesin at rates of 4, 6, and 18 lb/A. Neither Sesin nor Natrin gave satisfactory control of crabgrass.

PMA--Applied as a spray on July 6, 14, 23 and August 2. Reduced crabgrass to four plants per sq. ft. in best plots, but several plots showed poor control.

Potassium Cyanate--Applied in Milorganite at rate of 16 lb/A on July 28 and August 5. Crabgrass reduced to 2-3 weak plants per sq. ft.

Chlordane--Seventy-five percent emulsion plus 10 ml. 2, 4-D mine per plot applied on July 6, 14, and August 2. Results not uniform but some plots had 2-3 crabgrass plants per sq. ft. Control in others was not satisfactory.

These results indicate that pre-emergence treatments with SES and DCU are effective in controlling crabgrass. PMA, three or more post emergence treatments and KOCN powder, at seed head formation, also were effective. (Contribution from the Iowa Experiment Station.)

Response of crabgrass in turf to 2,4-dichlorophenoxyethyl benzoate. Lee, Oliver C. In comparison with several materials 2, 4-dichlorophenoxyethyl benzoate (sesin) appeared promising in 1954 trials for the control of crabgrass (Digitaria spp.) in Kentucky bluegrass turf. Rates of 2, 4 and 6 lb/A of active ingredient were applied just as crabgrass emerged. Repeated treatments of 4 and 6 lb/A on April 23, May 29, and June 22 reduced the stand of crabgrass to less than 1% of the stand of grasses as compared to 10% for adjoining check areas. Single applications of 6 lb/A gave equally good results when the plots were watered just prior to and following treatments to encourage immediate germination of crabgrass seeds in the soil. No apparent injury to Kentucky bluegrass was noted. (Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana.)

Crabgrass control in bluegrass turf. Nylund, R. E. In 1954, seven herbicides were applied to bluegrass turf at University Farm to 100 sq. ft. plots replicated four times. Crabgrass began emerging approximately July 1. The following four herbicides were applied prior to crabgrass emergence (June 8.) SES at 8 lb. in 200 gal. water per acre, NP (Alanap) at 8 lb. in 170 gal. water per acre, Chlordane at 15 lb. in 43 gal. non-toxic oil (Barco odorless thinner) per acre, and PAX (containing 13.2% lead arsenate and 3% nitrogen) at 2178 lb. per acre applied dry. A second application of SES, alanap, and Chlordane was made to the same plots one month after the first (July 6.) The following three herbicides were applied twice as post-emergence treatments: Standard Crabgrass Killer at 107 gal. per acre, PMA at 5 pints of 10% formulation in 100 gal. water per acre, and KOCN at 8 lb. in 100 gal. water per acre. The first of these was applied on July 7 and July 22, the latter two on July 7 and July 14. A wetting agent (Igepon AP-Extra) was added to the KOCN solution at the rate of 1 lb. per 100 gal. solution.

For all treatments grass was cut to 1½" on the day before herbicide application. The pre-emergence treatments (June 8) were followed by the application of approximately one inch of irrigation water on the day following application.

Weed counts made on August 3, showed that all herbicides except PAX and Standard Crabgrass Killer had significantly reduced the population of crabgrass plants. The percentages of crabgrass control were as follows: SES-66%, Alanap-75%, Chlordane-66%, PAX--53%, Standard Crabgrass Killer-41%, PMA-75%, and KOCN-97%. All of the treatments except SES caused some temporary discoloration of the bluegrass. Standard Crabgrass Killer and PAX caused death of bluegrass plants wherever overlapping of the spray occurred. (Paper No. 3256 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station.)

The effect of various herbicides applied to native sod. Wood, H. E. Watson, W. D. On May 29, in Winnipeg on loam soil in native sod, comprising several species of grass, 10 ft. sq. plots were knapsack sprayed using 40 imperial gal. water/A. At the end of the season results were: Dalapon at 10, 20, and 40 lbs/A retarded growth but by late fall there was considerable re-growth, except at 40 lbs. where control was rated as 85%. Amino triazole

at 1½, 3 and 6 lbs/A for the first 5-6 weeks appeared to be quite effective but from that date onward the grass on all plots made complete recovery. CMU (Karmex W, Karmex FW and Karmex DW) were applied at 213/4 and 43½lb/A giving only limited control on one plot (Karmex W at 43½ lb/A).
(Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Vegetables

Summary

G. F. Warren

Beans. In pre-emergence experiments with snap and lima beans grown on both mineral and muck soils, CIPC, DNBP, and CMU caused no injury while NP injured beans in the two experiments where it was tried. MCP, 2,4-D and several related herbicides caused injury on a mineral soil. Weed control with the above herbicides varied from poor to good in the different experiments. Pre-planting treatments of IPC did not hurt beans while dichloral urea caused severe damage.

Cabbage and Broccoli. Treatments with sodium 2,4,5-trichlorophenoxyethyl sulfate made one week after transplanting reduced the yield of these crops but the same herbicide applied three weeks later showed promise. Dichloral urea and a directed spray of TCA gave good grass control and no crop injury when applied one week after transplanting.

Cucurbits. Pre-emergence treatments of NP gave good results on muskmelons, cucumbers and watermelons. DNBP and dichloral urea showed promise on these crops in one experiment but severely reduced stands of muskmelons in another state. CIPC and sodium 2,4,5-trichlorophenoxy ethyl sulfate caused severe injury in the experiments reported.

Onions. In pre-emergence trials on muck soil, CIPC greatly reduced the weed population and did not affect the stand or yield of onions in three of four reports submitted. In the fourth experiment the stand was reduced. Other materials used in one or two experiments that gave considerable weed control without onion injury were: ethyl xanthogen disulfide, 2,4-D and Hydrin. In single experiments NP, CMU dichlorophenyl dimethyl urea, sodium 2,4,5-trichlorophenoxy ethyl sulfate and sodium alpha, alpha, dichloropropionate all reduced the stand or yield of onions. Five reports were received on post-emergence trials with overall sprays applied early or directed sprays on larger onions. CIPC, ethyl xanthogen disulfide and CMU gave fair to good weed control in these experiments without injury to the onions. On large onions, directed sprays were reported to cause less damage than overall treatments when dilute sulfuric acid or ethyl xanthogen disulfide were used. Stoddard solvent in the "loop" stage, some combinations of CMU with other herbicides, and directed sprays of dinitros also gave good results in single experiments. NP, Hydrin and endothal all caused injury to the onions.

Potatoes. Pre-emergence treatments of TCA and sodium alpha, alpha dichloropropionate controlled foxtail without causing damage to potatoes. IPC, however, reduced the yield in one of three experiments and controlled wild oats but not foxtail. DNBP and combinations of DNBP or CMU with TCA or sodium alpha, alpha dichloropropionate were promising as pre-emergence treatments on muck soil. In a post-emergence experiment 2,4-D caused more abnormal growth of potatoes than MCP.

Tomatoes and Peppers. Applications of 4 pounds of sodium 2,4,5-trichlorophenoxyethyl sulfate one week after transplanting resulted in almost complete kill of these crops in one experiment but gave good weed control and little damage to tomatoes in another trial. Later treatments caused less injury. Dichloral urea appeared promising for control of annual grasses in tomatoes.

Other Crops. Abstracts are included, which give information, on weed control in beets, carrots, okra, peas, peppermint, sweet corn, sweet potatoes, and tobacco plant beds. There are also 4 abstracts dealing with wild oats control in vegetable crops. Due to the diversity of the information contained in these they cannot be satisfactorily summarized and the reader is referred to the individual abstracts.

Abstracts

Beans

Comparison of 2,4-D, MCP, 4-Chloro Propionic and Acetic Acid on 3 types of beans. Beatty, R. H., Tafuro, A. J. and Guest, R. T. Two rows each of snap beans (Tendergreen), soybean (Hawkeye) and lima beans (Fordhook 242) were planted in 5' x 10' plots and replicated 3 times. Plots were sprayed immediately after planting as a pre-emergence spray at rates of 1 and 2 pounds of 2,4-D propionic acid (amine), MCP propionic acid (amine), 4-chlorophenoxy propionic acid (amine), 2,4-D (amine, MCP (amine) and 4-chloro (amine). Chloro IPC was used at 6 pounds per acre. Observations were taken for weed control and injury to crops 4 weeks after application and again at harvest time. Test was carried out on Ewingsville soil.

Results: All materials used except Chloro IPC gave moderate to severe injury to the 3 types of beans at the 1 and 2 pound rates used. 4-chloro acetic acid did not injure beans as much as the 4-chloro propionic acid formulation at the 1 pound rate, whereas, there was little or no difference where 2 pounds per acre was used. There was no significant difference between the MCP acetic acid or the MCP propionic acid on bean plants at both rates used. The 2,4-D acetic acid gave less injury to the bean plants at both rates than did 2,4-D propionic acid. Little or no difference was observed in annual broadleaf weed or annual grass control with any of the MCP, 2,4-D or 4-chloro materials used. Chloro IPC gave no injury to any of the 3 types of beans used and excellent weed control was observed. All materials except Chloro IPC delayed maturity of crop at least 1 to 2 weeks. (Agr. Res. Div., American Chemical Paint Co., Ambler, Pennsylvania).

Pre-emergence weed control in snap and lima beans. Lana, E. P. Snap and lima beans were planted on May 25. Herbicides were applied on May 27. Soil was moist, but not sticky at this time. 2.39 inches of rain fell within 30 hours after herbicide application. Treatments were replicated 4 times and applied in water at 50 gal./A. The following table gives the weed control in percent of the non-sprayed area, yields of snap beans and rainfall data for the period May 25 through May 30.

		Percent Weed Control				
Treatment	Rate/A	Lima Beans	Snap Beans	Yield Oz./10' Row	Rainfall	
Non-sprayed	-	-	-	133.6		
DNBP	4#	42.4	-29.6	137.4	May 25	0
	8#	50.4	14.3	156.8	26	.41
CIPC	4#	47.7	41.5	145.4	27	.55
	8#	43.1	43.7	156.4	28	1.84
NPA	4#	81.7	43.7	122.4	29	T
	8#	71.7	77.2	120.1	30	.36
CMU	1#	63.6	36.9	157.2		
	2#	44.0	36.3	145.5		

Except for NPA 4 and 8 pounds none of the above materials gave lasting satisfactory control. DNBP was exceptionally poor when previous data were considered. The residual effect was evidently reduced by the heavy rainfall after spray application. Weed counts were taken June 17 two weeks after bean emergence. NPA at both rates had a stunting effect early in the growing season. The reduction in yield by this material was not significant. Lima bean yields were not obtained because of a poor stand. (Iowa Agriculture Experiment Station, Ames, Iowa.)

Pre-emergence weed control in snap beans. Nylund, R. E. Topcrop snap beans seeded in muck soil on May 12, 1954 were sprayed with a number of herbicides on May 18 at which time the beans were sprouted but had not emerged. At the time of herbicide application the temperature was 56°F., humidity 48%, soil surface was dry, weeds few and in the cotyledon stage. Rainfall for the 6 days prior to spraying totaled 0.02", and for the 6 days following spraying, 0.63". The following acre rates of herbicides were applied at 30 psi. pressure and in 80 gal. water per acre to single rod-row plots replicated five times: 6 and 9 lb. DNBP, amine (Premerge); 2 lb. CMU; 10 gal. Hydrin (E. H. #3); 4 and 8 lb. amine triazole; and 12 lb. NP (Alanap.) Only one treatment, Alanap, significantly reduced yields of beans. With the exception of Hydrin and 4 lb. Amino triazole, all the treatments gave highly significant weed control. CMU and Premerge were somewhat more effective than the other herbicides applied. (Paper No. 3249 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Beets and Carrots

Pre- and post-emergence weed control in garden beets. Nylund, R. E. King Red beets seeded on muck soil on May 21, 1954 were sprayed with various single and mixed herbicide on May 28 at which time the beets had sprouts to ½" long but had not emerged. At the time of herbicide application few weeds were emerged, temperature was 55° F., humidity 58%, and soil surface was wet. Rainfall for the 6 days preceding herbicide application totaled 1.60" for the 6 days following application, 1.31". Weed species present were primarily Amaranthus retroflexus, Capsella bursa-pastoris, and Setaria spp. Each of the following kinds and acre rates of herbicides were applied to five single rod-row plots and at 30 psi. pressure in 80 gal. water per acre: 10 lb. TCA, sodium salt, 6 lb. endothal, 2 lb. CMU, 10 gal. Hydrin (E.H. #3), 10 lb. TCA plus 6 lb. endothal, 2 lb. CMU plus 6 lb. endothal, 10 lb. TCA plus 1 lb. CMU plus 6 lb. endothal, 10 lb. TCA plus 4 lb. PCP, sodium salt, and 1 lb. CMU plus 4 lb. Sodium dichloropropionate (Dalapon). The following treatments were the only ones which gave highly significant weed control (59%-64%) without reducing stands and yields of beets: endothal alone, endothal plus TCA, and TCA plus PCP.

Post-emergence treatments were applied on June 15 to beets in the 4-8 leaf stage at which time Setaria had 2-4 leaves, Portulaca oleracea had 2-8 leaves, Amaranthus retroflexus had 4-5 leaves, and Capsella had 4-6 leaves. None of the three herbicides applied (8 lb. CIPC, 4 lb. Dalapon, 8 lb. Dalapon) gave significant weed control and all significantly reduced yields of marketable beets. (Paper No. 3254 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Pre- and post-emergence weed control in carrots. Nylund, R. E. In 1954, Scarlet Nantes carrots seeded in muck soil on May 21 were sprayed with the following pre-emergence herbicides six days after seeding: 2 lb. CMU, 10 gal. Hydrin (E.H. #3), and 80 gal. Stoddard solvent. The first two were applied in 80 gal. water per acre; the latter was applied undiluted. Very few weeds had emerged at

the time of herbicide application. Weed control obtained was: CMU-85%, Hydrin-35%, Stoddard solvent -6%. None of the treatments reduced stands or yields of carrots.

Two herbicides were applied as post-emergence treatments on June 15, at which time carrots were in the 2-leaf stage and numerous weeds were present. CIPC at 8 lb. per acre gave 55% weed control, and Stoddard solvent at 80 gal. per acre killed 97% of the weeds present. Weed species were Setaria spp., Amaranthus retroflexus, Portulaca oleracea, and Capsella bursa-pastoris. Neither of the post-emergence treatments adversely affected stands or yields of carrots. (Paper No. 3255 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Cabbage and Broccoli

Herbicides for Cole Crop transplants. Hemphill, D. D. Broccoli and cabbage transplants were sprayed with Natrin (sodium 2,4,5-trichlorophenoxyethyl sulfate) at the rates of 4, 6 and 8 pounds per acre. One group was treated one week after transplanting while a second spray was sprayed 3 weeks after transplanting. TCA, 8 pounds per acre, was also tested as a basal directed spray applied one week after transplanting. Natrin, at all rates, stunted plants and reduced stand seriously when applied one week after transplanting. Natrin, 4 pounds per acre, applied 3 weeks after transplanting appears promising. TCA gave good control of grasses and did not injury plants, but broad-leaved weed control was unsatisfactory. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Weed control in transplanted cabbage. Warren, G. F. Cabbage plants of the Globe variety were set by hand in a silt loam soil on June 7 and 8. On June 14, one day after a heavy rain, the following treatments were applied in 50 gal. of water per acre: dichloral urea, 8 and 16 lb/A; sodium 2,4,5-trichlorophenoxy ethyl sulfate (Natrin), 4 and 8 lb. The temperature was 85° F. and there was practically no rain during the next two weeks. Treatments were replicated 6 times. Weed control for all treatments, as determined by counts made June 25, was as follows: crabgrass (Digitaria sanguinalis) 55 to 65% control, foxtails (Setaria spp.) 58 to 69%, carpetweed (Mollugo verticillata) over 90%. Differences in control between the treatments were small and showed no trends. Dichloral urea gave practically no control of lamb's quarters (Chenopodium album) while Natrin killed 70 to 80% of this weed. The yield of marketable cabbage was not reduced by either of the dichloral urea treatments. Natrin, however, significantly reduced the yield by 16 and 21% for the 4 and 8 lb. rates respectively. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Cucurbits

Chemical Weed Control in Cucurbits-1954. Hemphill, D. D. The following chemicals were evaluated as herbicides in cantaloupes, cucumbers, and watermelons: DNBP (Premerge), Naphthyl Phthalamic Acid (NPA), CIPC, Dichloral Urea (DCU), and Natrin (sodium 2,4,5-trichlorophenoxy ethyl sulfate). DCU was applied 2 weeks before seeding while the other chemicals were applied just before emergence. CIPC and Natrin reduced stand severely. In addition to Premerge and NPA which are presently recommended, DCU at the rate of 10 pounds per acre applied 2 weeks before seeding appears promising as a herbicide for these crops. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Crabgrass control in muskmelons. Peterson, Lewis E. Pre-emergence sprays given in the table were applied May 8, 2 days after seeding, and the post-emergence sprays (not given in table) of NP 2 and 4 pounds and NP (emulsion form) 2 and 4 pounds were applied June 10 after the first cultivation and thinning. The treatments were applied in water at 100 gal./A. and replicated six times. A 3/4 inch irrigation was applied immediately after the pre-emergence treatments. The soil type is coarse sand.

Treatment	Rate/A	Hand labor hours/A.	Rainfall for period May 10 - 31	
None	-	13.01	May 10	.75 (by irrigation)
NP	2#	1.92	23	.05
	4#	1.56	26	.15
	8#	1.24	27	.21
DNBP	1/2 gal.	7.24	28	.46
	1 gal.	5.64	31	1.91
	2 gal.	4.72		

Pre-emergence applications of NP gave nearly perfect weed control as indicated by the highly significant reduction in the hours of hand labor over DNBP and the check. DNBP failed to give satisfactory weed control; other data showed that DNBP caused a severe reduction in the stand when applied just before emergence. None of the treatments caused any plant injury and there were no significant differences in the yield of marketable fruits between any of the treatments or the check.

Preliminary replicated trials with pre-emergence applications of Natrin 80S at 2, 4, and 8 pounds and DCU73W at 4, 8 and 16 pounds were made 2 days after seeding. Natrin 80S at 2 pounds caused moderate loss in stand and the 4 and 8 pound rates caused a complete loss in stand. DCU73W caused moderate to severe reductions in stand. (Iowa Agricultural Experiment Station, Ames, Iowa.)

Onions

Effect of pre- and post-emergence weed control chemicals on the yield of onions in a commercial planting. E. K. Alban. Through the cooperation of a local grower, Mr. John Stambaugh, a series of pre-and post-emergence weed control studies were carried on through the 1954 season with onions on a muck soil at Celeryville, Ohio. The pre-emergence series included Stoddard Solvent (40 gal/A.); CIPC (6.0#/A); LV ester of 2,4-D (0.5#/A) and the cultivated check plots. The post-emergence series included; CIPC (4.0#/A); CIPC (3.0#/A with a layby treatment of 6.0#/A); ethyl xanthogen disulfide, suspension (10.0#/A) and cultivated check plots. In the post-emergence series, three directed basal sprays of the chemicals were applied at approximately fifteen-day intervals after onions were six to eight inches high. All plots were hand weeded through the season. Plot size was approximately one acre and each chemical treatment was replicated five times and check plots were replicated fifteen times. Weed Control: In the pre-emergence series, the average weeding time was found to be about 18 hours/A for the check and Stoddard Solvent plots; 9 hours/A for the LV ester of 2,4-D; and about 4 hours/A for the CIPC plots. With the post-emergence series, check plots required about 16 hours/A to hand weed, while the ethyl xanthogen disulfide treatments required 6 hours/A, and the CIPC plots approximately 4 hours/A. Purslane, Portulaca

oleraceae, 75%; grasses, Setaria sp., and Digitaria sp.; 15%; and pigweed or redroot, Amaranthus retroflexus, lamb's quarters, Chemopodium alba, and smartweed, Polygonum sp. were the major weeds. Crop Yield: In the pre-emergence series, check plots averaged 820 bu/A; Stoddard solvent, 837 bu/A; CIPC, 841 bu/A; and LV ester of 2,4-D, 803 bu/A. In the post-emergence series, check plots averaged 841 bu/A; CIPC, 4.0# rate, 837 bu/A; CIPC, 3.0# and 6.0# rates, 833 bu/A; and the ethyl xanthogen disulfide plots, 816 bu/A. There were no statistically significant differences between treatment yields in either series. However, significant reductions in cost of hand-weeding, of the order of 70 to 80 percent of checks, were noted in these studies and resulted in a significant increase in net return per acre. (Ohio Agricultural Experiment Station, Wooster, Ohio).

Pre-emergence weed control in onions. Nylund, R. E. In 1954, Brigham Yellow Globe onions seeded in muck soil on April 28 were sprayed with various herbicides on May 18 approximately three days before onion emergence. At the time of herbicide applications few weeds had emerged and onions had sprouts to 1" long; temperature was 56° F., humidity 48%, soil surface was dry. Precipitation for the 6 days prior to herbicide application totaled 0.02"; for the 6 days following, 0.89". Weed species present were Amaranthus retroflexus, Setaria spp., and Capsella bursa-pastoris. Plots were single rows, one rod long and replicated five times in randomized blocks. The following herbicides were applied in 80 gal. water per acre and at a pressure of 30 psi.: 1.6 and 2 lb. CMU; 2 lb. dichlorophenyl dimethyl urea (Karmex DW); 2,4, and 8 lb. sodium dichloropropionate (Dalapon); 8 and 12 lb. CIPC; 10 gal. Hydrin (E.H. #3); and 10 lb. Xanthogen disulphide (herbisan). None of the herbicides applied gave significant control of grasses, but all except Dalapon at 2 lb. per acre gave significant broad-leaved weed control. Both Karmex DW and 8 lb. Dalapon significantly reduced onion stands; and CMU, Karmex DW and Dalapon at 4 and 8 lb. reduced onion yields. The following herbicides gave good control of broad-leaved weeds (percent weed control given in parentheses) without significantly reducing onion yields: 8 lb. CIPC (43%), 12 lb. CIPC (67%), 10 gal. Hydrin (67%), and 10 lb. Xanthogen disulphide (69%). (Paper No. 3257 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Early post-emergence weed control in onions. Nylund, R. E. In 1954, Brigham Yellow Globe onions seeded in muck soil on April 28 were sprayed with various herbicides on June 9 at which time the onions were in late one-leaf to early two-leaf stage. Temperature at the time of application was 73° F., humidity 55%, soil surface was dry, and numerous weeds were present. Precipitation for the 6 days prior to herbicide application totaled 0.09"; for the 6 days following application, 0.65". Each treatment was applied to single row plots one rod long and replicated five times. The herbicides were applied at 30 psi. pressure in 80 gal. water per acre. All of the herbicides applied significantly reduced the numbers of broad-leaved weeds and tended to reduce stands of annual grasses. Only one treatment, 8 gal. Hydrin (EH #3) significantly reduced stands and yields of onions. The herbicides applied and the percentages of weed control obtained were: 1.6 lb. CMU (88%), 2.0 lb. CMU (74%), 6 lb. CIPC (64%), 8 lb. CIPC (50%), 8 gal. Hydrin (78%), 10 lb. Xanthogen disulphide (67%), ½ lb. CMU plus 2 lb. endothal (74%), 1 lb. CMU plus 2 lb. endothal (85%), 1 lb. CMU plus 2 lb. Dalapon (88%), 1 lb. CMU plus 4 lb. Dalapon (83%). (Paper No. 3251 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Late-post-emergence weed control in onions. Nylund, R. E. In 1954, Brigham Yellow Globe onions seeded in muck soil on April 28 were sprayed with various herbicides applied as basal directed sprays on July 15 at which time the onions had 6-7 leaves and bulbs to 1" diameter. On the day of herbicide

application the temperature was 80° F., the soil surface was dry, and few weeds were present - the field having been handweeded 6 days earlier. The principal weed species present was Portulaca oleracea. Precipitation for the 6 days prior to herbicide application totaled 0.57"; no rain fell during the 6 days following application. The following herbicides were applied in 80 gal. water per acre and at 30 psi. pressure to single row plots one rod long and replicated five times: 1.875 lb. DNBP (Dow General); 1.5 and 3.0 lb. DNBP, alkanolamine salt (Premerge); 1.6 and 2.0 lb. CMU; 10 gal. Hydrin (E.H. #3); 8 and 12 lb. CIPC; 10 lb. endothal; 10 lb. Xanthogen disulphide (Herbisan); and 2 lb. CMU plus 4 lb. Dalapon. All of the treatments with the exception of 8 lb. CIPC gave highly significant control of broad-leaved weeds. None gave significant control of grasses. Four treatments- 3 lb. Premerge, Hydrin, endothal, and CMU plus Dalapon - significantly reduced yields of onions. With the herbicide treatments which did not reduce yields, the following percentages of weed control were obtained: Dow General (67%), 1.5 lb. Premerge (67%), 1.6 lb. CMU (89%), 2 lb. CMU (100%), 8 lb. CIPC (50%), 12 lb. CIPC (72%), 10 lb. Xanthogen disulphide (89%). (Paper No. 3252 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Control of weeds in onions in the "loop" stage. Warren, G. F. and Larsen, J. E. Early Yellow Globe onions planted May 27 on muck soil were sprayed June 8 when about 75% of the onions were emerged and none were beyond the "loop" stage. The treatments were replicated 4 times and were applied at a volume of 25 gal./A with 20 lb. pressure. Spraying was done between 4 and 5 p.m. on a hazy day with high humidity and a temperature of 80° F. Many weeds were up, the soil surface was dry and there was only .54 inches of rain in the next 10 days. Weed counts made June 16 are shown in the following table:

Herbicide	Rate/A	No. Weeds per sq. ft. Grass	Pigweed	Purslane	Carpetweed
Check	----	28.0	35.6	39.9	3.6
Stoddard solvent	25 gal.	10.7**	24.0*	8.1**	.1**
CIPC	8 lb.	7.0**	30.3	2.7**	.1**
CIPC in Stoddard solvent	8 lb. 25 gal.	3.8**	19.9*	.0**	.1**

* and ** significantly lower than the check at the 5% and 1% levels respectively.

While the mixture of CIPC and Stoddard solvent gave the best weed control it also caused severe damage to the onions and a considerable reduction in stand. Either CIPC or Stoddard solvent alone did not reduce the stand of the onions and no injury was observed from these treatments. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana)

Comparison of directed with over-the-top post-emergence weed sprays on onions. Warren, G. F. and Larsen, J. E. Southport Yellow Globe onions planted May 18 on muck soil were kept weeded until about 10 days before the following herbicides were applied on July 15: sulfuric acid, 3% by volume; bis ethyl xanthogen disulfide as a wettable powder, 10 lb/A; and bis ethyl xanthogen disulfide as an emulsion (Herbisan 91), 10 lb/A. Each material was applied in four replications both as an over-the-top and directed spray at the rate of 100 gal./A using 20 lb. pressure. The directed sprays were applied with 110° nozzles between the onion rows and adjusted so that only the lower 2 to 3 inches of the onion plants were hit by the spray. The temperature was 75° F., the sky clear and the soil surface dry when the treatments were applied. There was no rain during the next 4

days. Weed control for the various treatments, as determined by counts made 11 days after spraying ranged from 75 to 85% for pigweed (Amaranthus retroflexus), 75 to 95% for love grass (Eragrostis spp.) and mostly from 50 to 70% for crabgrass (Digitaria sanguinalis). There were no important differences in weed control between herbicides or methods of application. The directed sprays caused little or no injury to the onions and the yield was not reduced. Over-the-top sprays, however, caused some injury which resulted in significant reductions in the yield of onions over 1½ inches in diameter. The greatest reduction, approximately 30% was for sulfuric acid. These results indicate the value of the chemicals tried for selective post-emergence weed control in onions and emphasize the importance of directing such sprays to keep contact with the onion plant at a minimum. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Pre-emergence weed control in onions. Waywell, C. G. Plots seeded to Early Yellow Globe onions on muck soil were treated with Natrin (2,4,5-trichlorophenoxyethyl sulfate, sodium salt) at 4 and 6 lbs/A, NP at 4 and 6 lbs/A, NP (90) at 4 lbs/A and CIPC at 4 and 6 lbs/A. Weed control with all chemicals was good with an average of over 85% control in all plots. Emergence of onion seedlings was severely reduced with all treatments. Counts of onion stand (average of 3 replicates) two months after treatment were as follows. Check - 207, CIPC 4 lbs/A -164, CIPC 6 lbs/A - 111; all others were less than 20. (Ontario Agricultural College, Guelph, Ontario, Canada.)

Post-emergence weed control in onions. Waywell, C. G. Over-all treatments were applied to Early Yellow Globe onions growing on a muck soil approximately 3 weeks after emergence. The chemicals used were: Natrin (2,4,5-trichlorophenoxyethyl sulfate, sodium salt) at 4 and 6 lbs/A, NP at 4 and 6 lbs/A, NP (90) at 4 lbs/A, and CIPC at 4 and 6 lbs/A. The average stand of onions one month after treatment in comparison with the check was as follows: Natrin 4 - 66%, Natrin 6 - 78%, NP 4 - 28%, NP 6 - 12%, NP (90) 4 - 37%, CIPC 4 - 85%, and CIPC 6 - 85%. (Ontario Agricultural College, Guelph, Ontario, Canada.)

Potatoes

Effect of IPC and TCA on the yield of potato tubers. Andersen, E. T. and Smits, O. Pre-planting and pre-emergence treatments of IPC and pre-emergence and post-emergence treatments of TCA were made to a potato crop in order to study the effect on tuber yield. IPC was applied at 4 and 6 lb./A. The pre-planting treatment of IPC was made on May 21, which was 11 days prior to planting. The pre-emergence treatments were made 12 days after planting, and the post-emergence treatment of TCA was made on July 5. The chemicals were not incorporated into the soil. Average weights of market tubers per plant harvested on Sept. 15 were as follows: Check - 483 gms; TCA (pre-emergence) 4 lb/A - 378 gms, 8 lb/A - 480 gms; TCA (post-emergence) 4 lb/A - 316 gms, 8 lb/A - 301 gms; IPC (pre-planting) 4 lb/A - 357 gms, 6 lb/A - 330 gms; IPC (pre-emergence) 4 lb/A - 286 gms, 6 lb/A - 168 gms. The results show that IPC caused a greater reduction in yield than did TCA. The post-emergence treatment of TCA was more severe than the pre-emergence, and the pre-emergence treatment of IPC more severe than the pre-planting. (Division of Plant Science, The University of Manitoba.)

Effect of MCP and 2,4-D on potatoes. Dabbs, D, H. and Forsberg, D. E. Irish Cobbler and Warba potatoes were sprayed with MCP butyl ester, amine and sodium salt at dosages of 0, 1/8, ¼ and ½ lb/A and 2,4-D amine at ¼ lb/A during the 4 to 5 leaf stage. A hand weeded check was also included. At time of spraying the

weed population consisted mostly of stinkweed, wild buckwheat, red root pigweed, russian thistle and lamb's quarters. One week after spraying the stinkweed and lamb's quarters were most affected by the heaviest rates of MCP, particularly the ester formulation. After three weeks virtually all stinkweed and lamb's quarters were dead on those plots treated with the highest rate of each of the MCP formulations. Red root pigweed, russian thistle and wild buckwheat were not more than temporarily stunted by any treatment. Buckwheat ran rampant where susceptible weeds had been killed. This tended to nullify any effects on yield. The Warba variety showed considerably more distortion of new leaves than did the Irish Cobbler variety. The 2,4-D treatment caused the most abnormal growth. The hand weeded check significantly outyielded all other treatments for both varieties, while all treatments except the low rates outyielded the unweeded check. Warba tubers from the hand weeded check were significantly smaller than from all but the 2,4-D treatment, and they were largest from the hand weeded check. Irish Cobbler tubers from the unweeded check were only significantly smaller than the hand weeded check and the two highest rates of MCP ester. Tubers from the hand weeded check were only significantly larger than those from the unweeded check. (Dominion Experimental Station, Scott, Sask.)

Pre-emergence weed control in potatoes. Nylund, R. E. Kennebec potatoes planted on muck soil on April 28, 1954 were sprayed with a number of herbicides on May 25 at which time about 20% of the potato plants had emerged. At the time of application the temperature was 62° F., humidity 38%, soil surface was wet, and weeds were numerous and in the cotyledon to 2-leaf stage. Precipitation during the 6 days prior to spraying totaled 0.63"; during the 6 days following spraying, 0.98". The following kinds and acre rates of herbicides were applied in 80 gal. water per acre at 30 psi. pressure to single 33' -row plots replicated five times: 6 and 9 lb. DNBP, amine salt (Premerge); 4 and 8 lb. sodium dichloropropionate (Dalapon); 2 lb. CMU; 1 lb. 2,4-D, propylene glycol butyl either ester; 1 and 2 lb. 2,4,5-trichlorophenoxypropionic ester (Kuron); 2 lb. CMU plus 10 lb. TCA, sodium salt; 6 lb. Premerge plus 10 lb. TCA; 6 lb. Premerge plus 8 lb. Dalapon; and 2 lb. CMU plus 8 lb. Dalapon. While none of the treatments dignificantly reduced yield of potatoes, only a few gave significant weed control. These were: 9 lb. Premerge, CMU plus TCA, Premerge plus TCA, Premerge plus Dalapon, and CMU plus Dalapon. (Paper No. 3253 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Pre-emergence treatments of Bliss Triumph potatoes with various herbicides for weed control. Pavlychenko, T. K. and Bestrop, A. J. One series of plots 12 x 18 ft. in size was treated 3 to 4 days prior to emergence with 1 and 2 lb/A rates of: low volatile butoxy ethanol esters of 2,4-D (Weedone LV4 and ACP-L-659), para (ACP-L-660) and MCP (ACP-L-674); ethyl ester of 2,4-D (Weedone Concentrate); emulsifiable acid of 2,4-D (ACP 638); 3-p-chlorophenyl-1-1-dimenthylurea (CMU) and with 1, 2, 4, 6, 8 and 10 lb/A rates of 3, amino 1,2,4-triazole (Amizol). A second series was similarily treated, but the chemicals were thoroughly harrowed in immediately after spraying. The treated plots were not hoed until 5 weeks after treatment. Half of the check plots were left weedy until the same date and the other half were kept weed-free all season. The land was clay loam and moisture was abundant. Weed infestation was heavy and consisted of stinkweed (Thlaspe arvense), Russian thistle (Salsola kali) and lamb's quarters (Chenopodium album). RESULTS: The following general observations were recorded: Weed control was good for the 5 week period (no significant differences between rates or between series) and ranged from 94% with 2 lb/A of Weedone Concentrate to 82% with 1 lb/A of ACP-L-674; the great majority of chemicals and rates gave significant yield increases over the weedy check, ranging from 41% with 1 lb/A of ACP-L-660 to -5%

with 2 lb/A of ACP 638; harrowing in the chemicals appeared to increase their effect on the potatoes as an average yield increase of 12% (over the weedy check) occurred throughout this series as compared to 25% with the series applied to the surface; the weed-free plots yielded an average of 30% more than the weedy checks; some of the phenoxy type herbicides tended to increase height and intensify chlorophyll formation as compared with the checks. (Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan.)

Sweet Potatoes

Crabgrass control in sweet potatoes. Peterson, Lewis E. Orlis sweet potatoes were transplanted in coarse sand soil May 17 and the first cultivation was made June 5, immediately after which the weed sprays were applied. The following table gives weed control in hours of hand labor for the first weeding, total yields of sweet potatoes, and rainfall data for the period June 5 to 15:

Treatment	Rate/A	Hours/A	Marketable Yield Bu/A	Rainfall
None	-	15.49	193.6	June 15 1.97
Sesin	1#	11.91	236.8	
	2#	9.35	221.6	
	4#	8.06	207.2	
NP	4#	8.90	217.6	
	8#	9.90	185.6	
NP (imide)	4#	11.00	265.6	
	8#	12.60	274.4	

Sesin at 2 and 4 pounds and NP gave effective weed control although the saving in hours of labor were not significant. NP caused serious formative effects, however the reduction in yields were not significantly below the check. Other data showed that Sesin and NP both caused a serious reduction in the plant stand when applied immediately after transplanting. Although NP (imide) did not give effective weed control, the yield increases from the plots receiving NP (imide) were significant over all the other treatments and the check. The reasons for this stimulating effect is not known to the author. The treatments given in the table were repeated again June 19, after the second cultivation, and since very few weeds emerged after this cultivation, none of the treatments had a significant effect on the labor to hand weed.

Preliminary replicated trials with Natrin 80S and DCU73W both at 2, 4, and 8 pounds were sprayed on sweet potatoes after the first cultivation. Natrin 80S at 4 and 8 pounds caused serious formative effects and very little weed control resulted from the 2 pound rate. DCU73W caused no visible injury and 8 pounds gave only fair weed control. (Iowa Agricultural Experiment Station, Ames, Iowa.)

Weed control in sweet potatoes. Warren, G. F. On May 12, one day before machine transplanting of Oklahoma 46 sweet potatoes, the amine salt of DNBP at 9 lb/A and N-1 naphthyl phthalamic acid at 4 lb. were applied to a freshly worked fine sandy soil. On May 13, immediately after transplanting, the following additional treatments were applied in 100 gal. of water per A: SES, 2 and 4 lb; sodium 2,4,5-trichlorophenoxy ethyl sulfate, 4 lb; CIPC, 2 lb; N-1 napthyl phthalimide, 4 lb/A. The temperature was between 65 and 70° F. when spraying was

done and the only rainfall in the next 10 days was .65 inches on May 19 and 20. All plots were replicated 5 times. Counts of crabgrass (Digitaria sanguinalis) made June 11 showed 67% control for DNBP, 84% for CIPC, 88% for N-1 naphthyl phthalimide and over 94% for all the other treatments. No injury to the sweet potatoes was observed and the yield was not reduced by any of the treatments. Extremely low rainfall for two months after treatments were applied may have prevented much leaching of the herbicides to the crop roots. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Tomatoes and Peppers

Weed control in peppers and tomatoes. Hemphill, D. D. Natrin (sodium 2,4,5-trichlorophenoxyethyl sulfate) was applied as a foliage spray 1 week or 3 weeks after transplanting at rates of 4, 6, and 8 pounds per acre. All tomato and most peppers were killed by the application 1 week after transplanting. Tomatoes were seriously injured also by the applications 3 weeks after transplanting - considerable stunting and modification of foliage and stems at the 4 pound rate and complete killing of plants at the 8 pound rate. Peppers appeared considerably more tolerant of Natrin and applications at the 4 or 6 pound rate 3 weeks after transplanting appear promising. It should be emphasized that this experiment was conducted under conditions of extremely high temperatures and deficient rainfall. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri.)

Weed control in transplanted tomatoes. Warren, G. F. Georgia-grown Rutgers tomatoes were set by hand in a silt loam soil May 24 and given the following treatments on May 28: dichloral urea 7.6 and 15.2 lb/A; sodium 2,4,5-trichlorophenoxy ethyl sulfate (Natrin), 4 and 8 lb; dichloral urea, 7.6 lb. plus Natrin, 4 lb. The treatments were replicated four times. The sprays were applied in 50 gal. of water per acre on a cloudy day with intermittent light showers. Rainfall during the next week totaled 1.61 inches occurring as almost daily showers. All treatments gave over 90% control of crabgrass (Digitaria sanguinalis) and foxtails (Setaria spp.) which were the principal weeds present. The tomatoes showed severe stunting and a significant reduction in yield (24%) on the plots treated with 8 lb. of Natrin. Dichloral urea at 15.2 lb. and the mixture of dichloral urea and Natrin also stunted the tomatoes and reduced the yield 10 to 15% but this reduction was not quite significant at the 5% level. The other treatments caused little or no injury or reduction in yield. On June 25, dichloral urea at 7.6 and 15.2 lb/A and Natrin at 4 and 8 lb. were applied to additional plots. Natrin at the latter rates was also applied on July 16. None of these late treatments caused any apparent injury or reduction in yield. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.)

Other Crops

Effect of pre-emergence and post-emergence applications of TCA and Dalapon on wild oats and some horticultural crops. Andersen, E. T., and Smits, O. Wild oats were broadcast and worked in by Rototiller to a depth of 4-5 ins. on May 20, 1954. On June 2nd a series of horticultural crops and several weeds (green foxtail and wild mustard) were seeded on this area. On June 14, TCA and Dalapon were applied at 4 and 8 lbs./A acid equivalent to one half of these plots. On July 5 a similar post-emergence treatment was made on the other half of the plots. Results on weed control were as follows: All treatments of TCA were ineffective in controlling wild oats. However, TCA gave good control of green foxtail, the pre-emergence treatment giving 90 and 100% control for the 4 and 8 lb.

rates respectively, and the post-emergence treatment giving 60 and 95% control for the 4 and 8 lb. rates respectively. Dalapon gave good control of wild oats the pre-emergence treatment giving 50 and 70% control and the post-emergence treatment giving 60% and 80% control for the 4 and 8 lb. rates respectively. All treatments of Dalapon gave 100% control of green foxtail. Both chemicals were ineffective on wild mustard. The results on crop tolerance were as follows: Sugar beets, rape, and potatoes were resistant to all treatments. Corn and soybeans were susceptible to both chemicals at both rates and dates. Somewhat intermediate were peas and sunflowers. In general the post-emergence treatments were more toxic to the crop plants, while Dalapon was more toxic than TCA at equal rates. (Division of Plant Science, The University of Manitoba.)

Effect of fall applications of IPC and Endothal for the control of wild oats (Avena fatua) and green foxtail (Setaria viridis). Andersen, E. T. and Smits, O. Wild oats and green foxtail were broadcast on October 20, 1953. The wild oats was worked in by Rototiller to a depth of 5-6 inches, and the green foxtail was worked in with a hand rake. Eight days later IPC and Endothal were sprayed on this area at the rates of 5, 10, and 20 lbs/A active ingredient in 50 gallons of water, and then incorporated into the soil to a depth of 2 and 4 inches. On May 15, 1954, a series of horticultural crops were seeded on these plots at right angles to the chemical treatments. The effect of IPC was as follows: peas, soybeans, sugar beets, sunflowers, rape, and potatoes produced a normal crop; corn was normal at the 5 lb. rate but showed some reduction in stand at the higher rates. Wild oats was controlled 60, 89, and 99% for the 3 rates of IPC respectively. Control appeared to be better at the 2" depth than at the 4" depth. Green foxtail showed considerable tolerance, only the 20 pound rate causing some reduction in stand. Endothal had no effect on wild oats but caused some damage to green foxtail. Sugar beets, corn, and potatoes were completely resistant to Endothal but peas and soybeans were seriously damaged. Some stunting and reduction in stand of sunflowers and rape resulted from the Endothal treatments, the damage increasing with rate of application. (Division of Plant Science, The University of Manitoba.)

Weed control in tobacco plant beds with preseeding soil treatments. Freeman, J. F. Fall and spring treatments with methyl bromide soil fumigant, 10 lb/100 sq. yd. Fall and spring drench treatments of chlorobromopropene (CBP) Emulsible (Formulation A) 19 qt. in 200 gal. water/100 sq. yd.; fall drench treatments of "Old" Formulation CBP, 8 qt. in 200 gal. water/100 sq. yd. and "New" Formulation, 10 qt. in 200 gal. water/100 sq. yd; fall drench treatment of sodium cyanamide soluble, 37.5 lb. in 200 gal. water/100 sq. yd; fall treatment of dry calcium cyanamide 200 lb/100 sq. yd. worked into the soil, fall and spring treatments with heat from burning wood on the bed soil, and no treatment were compared on triplicated plots on Maury silt loam soil. Heavy bluegrass sod was plowed and the soil worked thoroughly prior to fall treatments and reworked in the spring for spring treatments and no treatment plots. The fall treatments were made early in October and spring treatments early in March, approximately one month before tobacco was seeded. Warm weather prevailed during both periods. The numbers of each species of weeds were determined for each plot. The percentage control based on the total number of weeds on the untreated plots (169 weeds/sq.yd.) were: methyl bromide (fall) 77%; methyl bromide (spring) 83%; CBP-emul form A (fall) 81%; CBP-emul form A (spring) 79%; CBP-emul "Old" form (fall) 67%; CBP-emul "New" form (fall) 61%; sodium cyanamide, soluble (fall) 74%; calcium cyanamide (fall) 81%; burned (fall) 77%; burned (spring) 83%. (Kentucky Agricultural Experiment Station).

Chemical weed control in Okra. Hemphill, D. D. Results of 4 years of studies indicate that DNBP (Amine) (Premerge) at the rate of 4 pounds per acre or CIPC at 10 pounds per acre, as pre-emergence sprays are the most satisfactory chemicals for this crop. Effective weed control with little if any injury to the crop is obtained. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri.)

Pre-emergence weed control in peppermint. Larsen, J. E. and Warren, G. F. Peppermint stolens planted 2 to 3 inches deep in muck soil on April 16 were sprayed on April 23 with the following herbicides: DNBP, amine salt, 6 and 10 lb/A; CIPC 4 and 8 lb; DNBP, amine salt, 6 lb plus CIPC 4 lb; DNBP, amine salt, 10 lb plus CIPC 8 lb. The mixtures of DNBP and CIPC were also applied with the addition of 5 lb. of TCA sodium salt. All treatments were replicated four times. The spray volume was 50 gal/A, pressure 20 lb. and temperature when treated was 48° to 62° F. At time of treatment the mint was just starting to emerge, many weeds were up, the soil was moist and 2.33 inches of rain fell in the next two days. All sprays containing CIPC gave almost perfect control of smartweed (Polygonum spp.) but DNBP alone gave only fair to poor control of this weed. All sprays containing DNBP gave good control of ragweed (Ambrosia artemisiifolia) while CIPC alone gave little or no control. Annual grasses were reduced in numbers by over 60% by all treatments but the best control was obtained where the higher rates of application were used. The addition of TCA did not improve the control of grasses or broad-leaved weeds. There was no apparent injury to the peppermint and the yield of oil was not reduced by any of the treatments. Based on this experiment, those conducted in previous years, and several unreplicated large plot trials, a mixture of CIPC and DNBP appears well adapted for pre-emergence weed control in peppermint grown on muck soil. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Effects of pre-planting treatments of IPC and DCU on wild oats, green foxtail, and several crop plants. Sexsmith, J. J. Applications of IPC at 5 lb/A and dichloral urea (DCU) at 5 and 10 lb/A were made to duplicate plot areas and disked into the soil one day before seeding 8-ft rows of a variety of crops, on land which had been previously broadcast seeded with wild oats and green foxtail. Final assessment of results was made 3½ months later. Wild oat control was fair to good for 5 lb. IPC, and poor to fair for 5 and 10 lb. DCU. Green foxtail control was nil for IPC, and fair and good for 5 and 10 lb. DCU. The 5-lb. rate of IPC had caused no injury to sugar beets, red table beets, canning peas, beans (dry and green), commercial mustard, carrots, and safflower. IPC caused only slight stunting of sweet corn, thinned flax stand slightly, thinned barley stand by perhaps 50%, and almost completely killed out the spring wheat. DCU treatments at the 5- and 10-lb. rates caused little or no injury to sugar beets, red table beets, barley, commercial mustard, and carrots. The 5-lb. rate of DCU caused some thinning, stunting, and delay of corn, flax, and safflower; seriously thinned wheat stand; caused some slight stunting of canning peas; and seriously thinned stands and delayed growth of both types of beans. The same relative effects, though to a more serious degree, resulted from 10 lb. DCU treatment. (Canada Dept. of Agriculture, Experimental Station, Lethbridge, Alberta.)

Weed control in sweet corn with DNBP. Warren, G. F. Huron sweet corn was planted 1½ to 2 inches deep in a fine sandy soil on May 28 and was sprayed with the amine salt of DNBP at the following rates and dates: May 28 (immediately after planting), 6 and 9 lb/A; June 2 (spike stage), 3 and 6 lb; June 5 (two-leaf stage), 3 and 6 lb; June 9 (four-leaf stage), 3 and 6 lb. The spray volume was 50 gal/A and the temperature was between 77 and 83° F. for all applications except those made June 5 when it was 67° F. There was .20 inches of rain May 29, .65 inches June 1, 1.06 inches June 3 and 4 and none thereafter for the next 8 days. All treatments were replicated 6 times. Almost the entire weed population was made up of crabgrass (Digitaria sanguinalis) and goose grass (Eleusine indica). All treatments gave over 90% control of these grasses and all of the post-emergence applications at the 6 pound rate gave 100% kill. All sprays except those made June 2 caused severe injury to the sweet corn resulting in a large reduction in number and weight of marketable ears. The applications made on June 2, when the corn was in the spike stage, did not cause any apparent injury and did not significantly reduce the yield. Since the 3 lb. rate gave good grass control and the 6 lb. rate caused no injury, there would appear to be a good margin of safety in a 3 lb. application at this stage. However, the injury incurred at the same rate 3 days later when the sweet corn was in the two-leaf stage would indicate that timing is extremely critical. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

FRUITS

Summary — D. D. Hemphill

Grapes. Report of work at one station indicates that CIPC, 10 to 14 pounds per acre, or CMU, 2 pounds per acre, gave more effective and longer lasting weed control than dinitro fortified diesel oil. Chlorosis on leaves of new transplants indicates that CMU should be used only in mature vineyards and further research with this herbicide is needed.

Raspberries. Continued work with SES and current work with related compounds SESIN (2,4-dichlorophenoxyethyl benzoate) and NATRIN (sodium 2,4,5-trichlorophenoxyethyl sulfate) demonstrates the value of these chemicals as herbicides in raspberries. Importance of soil moisture for activation of these chemicals is emphasized.

Strawberries. Reports from two stations indicate that NATRIN (sodium 2,4,5-trichlorophenoxyethyl sulfate) and SESIN (2,4-dichlorophenoxyethyl benzoate) are promising herbicides for this crop with possible longer residual action than SES.

Abstracts

Chemical weed control in grape vineyards. Hemphill, D. D. During a 5 year period the following chemicals have been compared with dinitro fortified diesel oil as a herbicide for use in the grape vineyard: Isopropyl-N-(3 Chlorophenyl) - carbamate (CIPC), Phenyldimethyl urea, 3-(p-Chlorophenyl)-1, 1-dimethyl urea (CMU), Naphthyl phthalamic acid (NPA), Sodium 2,4-dichlorophenoxyethyl sulfate (SES), Disodium 3,6-endoxohexahydrophthalate (Endothal).

Both CIPC at the rate of 10 to 14 pounds per acre and CMU at the rate of 2 pounds per acre appear to be superior to dinitro fortified oil. One application of either chemical gives satisfactory weed control for the entire season while 2 or more applications of dinitro fortified oil are necessary.

No harmful effects have been observed from the use of CIPC. Chlorosis on leaves of new transplants have been observed in CMU plots, and therefore, it should be used in mature vineyards only. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Chemical weed control in raspberries. Denisen, E. L. The following herbicides and rates were applied on July 30 to a new planting of Latham raspberries: SES - 4 lbs./A; SESIN (benzoate form of SES in xylene) - 4 lbs./A; SESIN - 6 lbs./A; NATRIN (sodium 2,4,5-trichlorophenoxyethyl sulfate) - 4 lbs./A; and NATRIN - 6 lbs./A. Less than 0.2 inch of precipitation fell during the previous five weeks so in view of previous failure of the herbicides to become active in dry soil, irrigation was used following application. One-half of each plot was irrigated with approximately 1/8 inch of water. However, a shower of .08 inch occurred six hours after spraying and the effect of irrigation was lost. The light rain (.08 inch) was apparently sufficient to aid the conversion of herbicides to active form, for effective weed control was obtained in all sprayed plots as weed seed germination proceeded. From observations over the past four years, mid-summer applications of SES seem to remain effective longer than early summer applications. This was true in 1954 even though there were heavy rains during the latter half of August and the early half of October. The principal late summer weeds were annual grasses and pigweed which were very effectively controlled through late October by all five treatments compared to the unsprayed check. (Department of Horticulture, Iowa State College, Ames, Iowa).

Chemical weed control in strawberries. Denisen, E. L. The following herbicides and rates were applied twice during the season to spring planted Premier strawberries: SES - 4 lbs./A; SESIN (benzoate form of SES in xylene) - 6 lbs./A; SESIN - 8 lbs./A; NATRIN (2,4,5-trichlorophenoxyethyl sulfate) - 4 lbs./A; and NATRIN - 6 lbs./A. All plots including an unsprayed check were hand weeded prior to spray applications. The first application was made on July 10 to plots which had received approximately 1/2 in. of water by irrigation the previous day. All herbicides gave effective control of weeds which consisted mostly of purslane, barnyard grass and pigweed. The herbicide treatments with the longest residual effect were SESIN at 6 and 8 lbs. and NATRIN at 6 lbs. which gave good control up until 6 weeks following treatment. The plots received adequate moisture during this period through irrigation so that the effective period of the herbicides was not extended due to drouth. The same treatments were again applied on September 4 and gave good weed control. On this date of application, NATRIN was as effective at 4 lbs./A as at 6 lbs./A and on both dates SESIN was equally effective at 6 and 8 lbs./A. No injury was noted on the strawberry foliage from the xylene carrier of SESIN. Sprays were applied at rates of approximately 100 gal./A with a 3-nozzle-boom lawn sprayer. (Department of Horticulture, Iowa State College, Ames, Iowa).

Weed control in strawberries. Herron, J. W. and Chaplin, Carl E. A project was initiated in the spring of 1954 for the control of weeds in strawberries. This report covers only the first season's growth. Data will be analyzed after next year's production. Variety used was Tennessee Beauty. The treatments included SES and Natrin (80 S) each at 3 lbs./A and 6 lbs./A, SES + CIPC each at 2 lbs./A, Sesin (50 W) at 6 lbs./A and 12 lbs./A, DCU (73 W) at 5 lbs./A and 10 lbs./A, CMU at 1/2, 1, 2 lbs./A and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea at 1/2, 1, 1-1/2, 2 lbs./A. Amount of water used per plot was 1/2 pint or 108.25 gal./A. Four replications of each treatment were made. Each treatment consisted of an area 2 ft. by 12-1/2 ft. centered over rows spaced 4 ft. apart. The initial treatments on all plots were made approximately 3 weeks after setting of the plants. Three additional treatments with all materials except CMU and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea were later applied at approximately 6 week intervals. Medium to good fruiting rows were obtained in the best plots even though severe drought conditions prevailed from the first of June through September. Although the data has not been statistically analyzed as yet, it is evident that SES, Sesin, Natrin, SES + CIPC, in all treatments gave satisfactory weed control. However, SES, Natrin, and SES + CIPC at the higher rates inhibited runner development to some extent. CMU and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea both killed a large percentage of strawberry plants at the higher concentrations. Lower rates of these materials injured the strawberry plants and did not give satisfactory weed control. DCU was not as effective as SES, Sesin, Natrin or SES + CIPC, but no injury to the plants was observed and it is worthy of further trial. (Kentucky Agricultural Experiment Station, Lexington, Kentucky).

HERBACEOUS WEEDS IN WOODY CROP PLANTS AND FLOWERS INCLUDING FOREST NURSERIES, ORNAMENTAL NURSERIES, SHELTERBELTS, AND ALL OTHERS.

J. P. MAHLSTEDE

Summary

Reports concerned with the control of herbaceous weeds in forest and ornamental nurseries were received from three stations.

Application of SES as a pre-emergence herbicide to established nursery and annual stock, growing on mineral soils reduced stands of both broad and narrow leaf weeds. Injury to species of Ligustrum and Euonymus was noted as a result of a July application of SES at the rate of 4#/A. Combination sprays containing SES and NP resulted in injury to Paeonia, and Syringa species. Sodium 2,4,5-trichlorophenoxyethyl sulfate gave highly effective weed control throughout the season and demonstrated excellent residual properties.

Dalapon was used to effectively kill grass foliage in established six-year-old red pine transplants, although scattered broad leaf weed activity and sparse re-growth of grass was noted. Combinations of TCA with CMU or KDW gave satisfactory weed control but caused injury to red pine seedlings.

After several years of testing it appears that CIPC has a definite place in the weed control program for nursery stock.

CMU, N.I.X., and Karmex DW appear to be promising chemicals for use as weed control measures in forest and ornamental plantings.

Abstracts

Chemical weed control in deciduous and evergreen nursery stock. L. C. Chadwick and P. A. Barker. During the summer of 1954, SES was applied as a directed post-emergence spray prior to weed emergence at 4 pounds per acre in field rows and bedded stock at four Ohio nurseries and in perennial beds at Ohio State University. Each plot was 1000 square feet, except with the herbaceous perennials, and treatments were made on July 12, 16, 22, 27, and 30; generally when the silt loam or fine sandy loam soils had good surface moisture. Application of the SES was made with a 3-gallon pressure sprayer and in 80 gallons of water per acre. In the test plots were a total of 28 deciduous shrub species, 18 evergreen species, and 74 perennial flowers. Weed control evaluations were indefinite but there was obvious reduction in field bindweed, lambsquarter, and crabgrass. SES caused various types of injury to a few plant species. Swelling occurred at ground level on stems of Ligustrum obtusifolium regelianum. Splitting was common on underground portions of Euonymus fortunei coloratus, and Euonymus kiautschovicus, out of which grew many small succulent roots. At ground level the bark of Euonymus alatus compactus loosened, heavy callus was proliferated and leaves turned prematurely purple. This condition might have been instigated by cultivator damage but it was more noticeable in treated plots. To eliminate purslane, that resulted from re-growth of stem cuttings, CIPC at 7.5 pounds and N.I.X. at 24 pounds per acre each were applied in two plots as supplemental treatments 4 weeks after the SES had been applied. Control was 100% with both but action was slower with CIPC. Slight curling on 24 to 30 inch plants of Viburnum rhytidophyllum leaves was observed. Results of this study

indicate that satisfactory weed control can be obtained with SLS but that its use on Ligustrum and Euonymus species should be restricted. (Ohio Agricultural Experiment Station, Wooster, Ohio).

Chemical weed control in Taxus. L. C. Chadwick and P. A. Barker. Directed post-emergence sprays of 2,4-D Amine, Alanap, CIPC, MH 40, and SES at rates of 1, 5, 7.5, 20, and 3 and 4 pounds per acre respectively were applied prior to weed emergence in a field nursery at Ohio State University during the 1954 growing season. Each test plot was 1000 square feet and contained 4-year plants of Taxus cuspidata intermedia. Application of all herbicides was made with a 3-gallon pressure sprayer and in 80 gallons of water per acre. Treatments, made on Brookston silt loam soil, included Series A, applied on June 1 and 4, Series B on July 10, and Series C on September 1, 3, and 4. Preceding each series, all plots were cleaned of weeds and debris, and then cultivated. Field bindweed and Canada thistle were not controlled. Alanap was most effective in controlling purslane, lambsquarter, pigweed, and prickly lettuce in Series A but in Series B, CIPC gave best results. Plots that were sprayed with CIPC were free of weeds for 7 weeks. SES likewise provided good control of most weeds although a more thorough removal of purslane stem cuttings and better surface moisture prior to application would have contributed to better effectiveness. Adequate weed control was not obtained where 2,4-D and MH 40 were applied. Applied as contact sprays, CIPC, at 7.5 pounds per acre killed purslane and N.I.X. at 24 pounds per acre eliminated most broad-leaved weeds. Grasses came in vigorously in plots where N.I.X. was applied but CIPC prevented most grass growth. No injury to the Taxus plants was noted from any of the treatments. (Ohio Agricultural Experiment Station, Wooster, Ohio).

Weed control in forest plantings. Kuntz, J. E. and A. J. Riker. Replicated plantings of dormant cottonwood cuttings and red pine transplants were made in May, 1954, on plowed and disked sites including sand, loam, and muck soils (see NCWCC Res. Rpt., 1952). Herbicides were applied immediately. Other experiments included older plantings. Rainfall was heavy in spring and fall. On sand and loam: 3-(p-chlorophenyl)-1, 1-dimethylurea (CMU) at 2 lb./A and 3-(3,4-dichlorophenyl)-1, 1 dimethylurea (Karmex DW) at 2 and 4 lb./A gave satisfactory, first-season, grass and weed control with no injury to trees. 3-phenyl-1, 1-dimethylurea (Karmex FW) at 2 lb./A permitted late-season grass recovery. At 4 lb./A, CMU and KFW caused considerable injury to trees. Combinations of either CMU at 2 lb. or KDW at 2 lb. with CIPC at 20 lb. or with TCA at 10 lb./A also gave satisfactory grass and weed control, but the TCA mixtures caused some injury to pine. June applications of a,a-dichloropropionic acid (Dalapon) at 10 and 20 lb./A killed all grass foliage without injury to trees, but occasionally permitted sparse re-growth by October. Scattered broadleaved weeds persisted. Midseason applications of phenyl dimethylurea (PDU) at 2, 4, and 8 lb./A gave excellent grass and weed control (bare), but caused increasing injury to trees. On muck: CMU, KDW, and KFW at 4 lb./A as well as combinations of CMU at 4 lb. with CIPC at 20 lb, endothal at 20 lb, or TCA at 10 lb./A controlled most grass and weeds with no injury to trees. June applications of Dalapon at 10 and 20 lb./A eliminated all grass but permitted dense growth of broadleaves.

In 3-year-old poplar plantings on muck and heavy loam, CMU, KDW, KFW, at 4 lb./A, CMU at 8 lb./A, and mixtures of CMU at 2 lb. with CIPC at 20 lb./A gave excellent weed control with no injury to the trees. Dalapon at 20 and 40 lb./A did not injure the poplars, but permitted dense growth of broadleaf weeds. On loam soil where dense quack grass prevailed, Dalapon at 20 and 50 lb./A killed

grass foliage with no injury to trees. In a 6-year-old mixed pine planting, mixtures of CMU at 2 lb. with CIPC at 20 lb., endothal at 20 lb., or TCA at 10 lb./A gave good initial control, but permitted dense re-growth of grass. Dalapon at 20 and 40 lb./A gave excellent grass control with no injury to pines. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Co.)

Reducing fire hazards from grass and weeds in pulpwood storage yards. Kuntz, J. E., Les Wellman, and A. J. Riker. The vigorous growth of grass and weeds present in pulpwood storage yards in central Wisconsin constitutes a serious fire hazard. Yard soils are high in accumulated organic matter. Weed control by mechanical means, such as mowing, disking, or rototilling, has critical limitations, and these procedures often aggravate the problem. In 1953, herbicidal treatments which previously had given sustained weed control in adjacent rototilled firelanes (without accumulated humus) proved inadequate when applied to established sod of storage yards (see NCWCC Res. Rpts. 1950, 1951, 1952). 3-(p-chlorophenyl)-1, 1-dimethylurea (CMU) at 10 and 20 lb./A, borascu at 10 lb./sq. rd, and mixtures of 2,4-D at 4 lb. and TCA at 25 lb./A, applied in April, May, and June, caused considerable injury to most grass and annual weeds, but allowed deep-rooted perennials to persist. Heavy re-growth occurred by midsummer, although weed populations changed strikingly. In 1954, CMU at 30 lb./A controlled most grass and annual weeds, but allowed bracken fern, horsetail, wild grape, Virginia creeper, milkweed, flowering spurge, dogbane, prickly lettuce, dandelion, ground cherry, toadflax, and others to persist. Results were variable: some areas remained bare; others showed vigorous recovery, especially in low-lying areas. CMU at 45, 60, and 80 lb./A gave more uniform and sustained control, although again allowing scattered deep-rooted perennials to survive. However, the majority were stunted, chlorotic, and necrotic. 3-phenyl-1, 1-dimethylurea (Karmex FW) and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea (Karmex DW) gave comparable results with KDW persisting somewhat longer. In limited midseason applications phenyl dimethylurea (PDU) at 60 and 80 lb./A gave excellent control of both grass and weeds. Applications of a,a-dichloropropionic acid (Dalapon) at 10, 20, 40, 60, and 80 lb./A gave good to excellent initial control of grass, but permitted vigorous growth of many broadleaf weeds and some recovery of grass by fall, especially at the lower rates. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Company).

Chemical weed control in established nursery stock. IV. Mahlstede, J. P. Eight replications containing 4-8 year-old established stock of Juniperus chinensis vars., Juniperus procumbens, Picea abies, Picea pungens, Pseudotsuga taxifolia, Syringa spp., and Paeonia spp. were sprayed with various pre-emergence herbicides after the plots had been cultivated and cleared of weeds. Each treatment was applied with a 50 gallon capacity sprayer to a moist soil surface (Webster type) utilizing a covered boom and a pressure of 100 psi. The following results, based on two criteria, namely (1) averages derived from weed counts, and (2) visual evaluation of weed vigor, which was found to be a close corollary to weed weight were obtained.

Chemical	Rate/A.	PERCENT WEED CONTROL Treatment 1* Weed Count	Treatment 1* Density and Vigor	Treatment 2** Weed Count	Treatment 2** Density and Vigor
SES	4	70	45	60	38
NATRIN	6	92	92	94	84
NP	5	82	78	76	66
SES + NP	2 ea.	87	83	71	56
SES + NP	5 ea.	93	97	84	78

* May 14 - June 17
** July 26 - Sept. 21

Since near drouth conditions existed between June 17 and July 26 it was not necessary to cultivate or apply weed control chemicals. Combination sprays which made use of SES and NP, applied May 14 resulted in severe epinasty of leaf petioles and blossom stems of Paeonia. In addition, leaf curl was evident on all deciduous materials contacted by the herbicide combination, although there was no evidence of translocation. A synergistic reaction, primarily due to the NP component was believed to be responsible for this effect. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa).

Weed control in lining-out stock. Mahlstede, J. P. Three-year-old liners of Ligustrum amurense, transplanted on a Tama-Shelby soil on April 30, 1954 were sprayed with various pre-emergence herbicides. Treatments were applied to six replications (90 square feet per replication) with the use of a low pressure sprayer and a covered boom. Weed control effectiveness was based on average weed counts as well as on visual evaluation of weed vigor and density, 32 days after the May 14 application and 56 days after the July 26 application. Elm seedlings, annual grasses and purslane were the principle weed types controlled. Rainfall was moderate immediately prior to and following the initial application. The interim between re-application of the herbicides, as well as during a portion of the following test were attended by extremely dry soil conditions. For this reason a delayed reading on weed control was recorded in order to test residual properties of the chemicals under evaluation. The results were as follows:

Chemical	Rate/A.	PERCENT WEED CONTROL Treatment 1 Weed Count	Treatment 1 Density and Vigor	Treatment 2 Weed Count	Treatment 2 Density and Vigor
SES	4	33	52	69	13
SESIN	8	46	74	29	6
NATRIN	6	75	76	86	75
NP	5	73	89	43	17

Fall observations indicated tolerance of the plant material to soil applications of the chemicals utilized in these trials. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa).

Pre-emergence weed control in annual beds. Mahlstede, J. P. Replicated plots containing Impatiens balsamina, Mathiola incana, Calendula officinalis, and Tagetes patula, transplanted from 2½ inch pots received the following pre-emergence treatments on June 18, one week after planting: (1) Natrin (4 and 8 lb./A.): (2) SES (4 lb./A). All plots were cultivated, top-dressed with a soil mixture containing a known weed-seed population and thoroughly watered immediately prior to herbicide application. Subsequent applications of water were made at intervals similar to those which would have been used to establish an annual border planting. Weeds were counted 4 weeks after the first application and general plot observations noted after eight weeks. Weed control from Natrin (4 and 8 lbs./A) was 76% and 82%, respectively, as compared to 72% from plots treated with SES (4 lb./A). The weed types in the check plots were principally purslane and annual grasses. Observations made two months after spray application revealed that all plots, with the exception of the controls were completely devoid of weeds. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa).

Control of Brush on Rangeland and Pastures

Harry M. Elwell

Summary

Abstracts on this subject were received from cooperators in Texas, Oklahoma, Nebraska, and the Canadian Province of Manitoba. The woody species studied were post, blackjack, and shinnery oak and buckbrush (western snowberry).

The oak species were satisfactorily controlled with two to three annual applications in consecutive years with either 2,4,5-TP, 2,4,5-T, 2,4-D, or a combination of 2,4,5-T and 2,4-D in ester formulations. Applications of the herbicides in alternate years were not as effective as those made consecutively. These chemicals in diesel oil or in an oil-water emulsion (1:3 or 1:4), aerially applied at 4 to 5 gallons per acre, provided a very good coverage of the foliage. The 2,4,5-TP in an initial application gave a higher control of post oak than did the 2,4,5-T. Both herbicides were more effective in controlling post oak than blackjack oak. Amine formulations of 2,4,5-T gave the least control of both oak species.

Buckbrush in Nebraska was successfully controlled with 1 pound per acre of 2,4-D isopropyl ester in water solutions applied annually on May 14 and 21 for three successive years. An amine formulation of 2,4-D at the same rate was considerably less effective. The amine and ester preparations of this herbicide at 2 pounds per acre, applied June 28, gave slightly greater control of the buckbrush than the lighter amount on the same date. However, the higher rate of both formulations was not as effective as the 1 pound per acre of 2,4-D ester applied on May 14 and 21. Annual mowing caused considerably less reduction in the number of buckbrush plants than the treatments with 2,4-D. In Canada, 1-1/2 pounds per acre of 2,4-D ester, in a single application made just after the full leaf stage, gave 100 percent kill of the buckbrush plants above the ground line. However, there were some sprouts from lateral roots. Comparable treatments with 2,4,5-T ester gave only equal kills.

Effects of single and repeated aerial applications of herbicides on post and blackjack oak. Darrow, R. A., and McCully, W. G. Aerial applications of 2,4,5-T ester, 2,4,5-T amine, and brushkiller (50% 2,4,5-T ester; 50% 2,4-D ester) were made at seven locations in post and blackjack oak woodland in May and June, 1952, at rates of 1 to 3 lb/A of 2,4,5-T and 1-1/2 to 4 lb/A of brushkiller at 4 and 8 gal/A. Repeat applications of 2,4,5-T ester at 2/3, 1, and 2 lb/A were made in May, 1953, on portions of two areas treated in 1952. In 1954, repeat applications of 2,4,5-T and 2(2,4,5-trichlorophenoxy) propionic acid were made at rates of 3/4, 1, and 1-1/2 lb/A at four locations originally sprayed in 1952. Drought conditions prevailed from 1952 to 1954 at most areas, except during the spring of 1954.

Single applications of 2,4,5-T ester at 2 lb/A and of brushkiller at 3 lb/A gave 30 to 34% kill of post oak and 12 to 18% kill of blackjack oak in observations made in October, 1953. No advantages were found with higher rates. Amine was less effective than the ester of 2,4,5-T.

Repeated applications of 2,4,5-T ester in successive years (1952-53) gave more effective control than comparable treatments made in alternate years (1952-54) as evaluated in October, 1954. Under favorable conditions, kills of 70 to 90% on post oak and 20 to 45% on blackjack oak were obtained with spray applications of 2,4,5-T ester and brushkiller totaling 3 to 4 lb/A in two consecutive years.

In May, 1954, aerial applications of the esters of 2,4,5-T and 2(2,4,5-trichlorophenoxy) propionic acid at 1-1/2 and 2 lb/A were made at six locations in 1:3 o/w emulsions at 4 gal/A. Observations in October, 1954, showed a greater initial topkill of post oak with 2,4,5 propionic than with 2,4,5-T at three locations; similar rates of defoliation were obtained at the three remaining areas. (Contribution of the Texas Agricultural Experiment Station, College Station, Texas.)

Approved as technical article by Director, Texas Agricultural Experiment Station, College Station, Texas.

Interim report on shinnery oak control studies in the Southern Great Plains. McIlvain, E. H. Eight different species of shinnery oak (Quercus) infest 15,000,000 acres of sandy rangeland in Texas, Oklahoma, and New Mexico. Dense stands of shinnery reduce forage production of nutritious grasses as much as 90 percent, and in addition, the brush is poisonous to livestock in early spring.

Early control methods of shinnery oak were by fire, mowing, and "goating." Neither fire nor mowing killed the shinnery, and resultant bush growth was usually thicker than the original stand. Nevertheless, grass growth was benefited for a year or two following burning or mowing, and progressive ranchers use these two methods with some success today. A well planned "goating" program will result in effective shinnery control but the practice is not in widespread use for several reasons.

Since 1947, over 700 plots of shinnery oak have been experimentally sprayed with chemicals by research personnel of the U. S. Southern Great Plains Field Station, Woodward, Oklahoma. Sprayings were made monthly throughout the year, and many different formulations and rates were used. Combinations of hormone chemicals, contact sprays, wetting agents, and spreading agents were employed. Repeat sprayings were made of the most promising treatments for three successive years. Herein seems to lie the success of chemical control.

Sprayings made in late May and early June have been most effective. The plants must be growing rapidly and soil moisture must be good. Dormant-season foliage and stem sprayings have not been successful.

The chemicals 2,4-D and 2,4,5-T were equally effective in retarding or killing top growth, and the lower cost of 2,4-D makes it the more promising chemical. The low volatile esters were more effective than the volatile esters. Increased quantities of 2,4-D up to 1 pound per acre caused appreciably more detrimental effect. Two pounds per acre were only slightly more effective than 1 pound. Diesel fuel oil used alone or in an oil-water emulsion is the most satisfactory carrier. At least 3 gallons should be used on each acre, and 5 gallons should be applied on dense tall brush.

Although conclusive recommendations cannot be made for absolute control of shinnery oak, the following suggestions are offered for those who wish to make limited trials: Spray shinnery oak for three consecutive years between May 15 and June 15 with a per acre rate of 1 pound of 2,4-D acid equivalent in a formulation of the volatile esters such as ethyl, butyl, or isopropyl, in 3 to 5 gallons of diesel oil or in an emulsion of 1 gallon diesel oil and 2 to 4 gallons of water. Or, if desired, spray for two consecutive years with a low volatile ester of 2,4-D. Remember, cotton grows near many shinnery areas! Experienced aerial applicators should do the work.

Annual costs will run about $2.50 per acre for the three sprayings, or slightly more for the two sprayings with low volatile esters. Returns from the investment are realized soon after the spray is applied, because the growth of shinnery oak is curtailed immediately and grass growth increases at once. (Contribution of the Field Crops Research Branch, Agricultural Research Service, USDA, U. S. Southern Great Plains Field Station, Woodward, Oklahoma.)

Effect of mowing and spraying with 2,4-D on buckbrush (Symphoricarpos occidentalis, Hook.). McCarty, M. K. Plots 10 x 30 ft. in two replications were established in a pasture near Lincoln in 1951.[1] The amine salt and isopropyl ester of 2,4-D were compared on the following five dates, May 14, 21, 28, June 28, and July 16, with mowing also compared on the three May dates. The buckbrush was in full leaf with regrowth shoots 4 to 10 inches long by the early treatment date. Results shown in the table were observed in the spring of 1954 prior to 1954 retreatment and show effect (expressed as percent reduction in stand) of 1951, 1952, and 1953 treatments except as indicated:

Treatment & Date	May 14*	May 21	May 28	June 28	July 16
Mowing	50	52	30	--	--
2,4-D Amine 1 lb.	65	60	45	45	20
2,4-D Ester** 1 lb.	95	92	82	40	20
2,4-D Amine 2 lb.				62	
2,4-D Ester** 2 lb.				72	

*May 14 treatment was not applied in 1951 because of weather conditions.
**Isopropyl.

Extremely dry weather conditions in 1953 with attendant poor forage production in the pasture resulted in close cropping of the buckbrush regrowth shoots in the mowed plots by the livestock. This gave a much more rigorous treatment than simple mowing and may be partially reflected in the indicated 50% kill on the earlier dates. The two early dates with 1 lb. of 2,4-D ester indicate good reduction of stand and somewhat more effective results than the amine salt. The remaining plants in the ester plots were all from below ground line whereas many of the old stems in the amine treated plots showed some regrowth.

[1] Experiment was set up and carried through 1952 by Dr. D. L. Klingman, Section of Weed Investigations, ARS, now at Columbia, Missouri. (Contribution of the Field Crops Research Branch, Agricultural Research Service, USDA, and the Nebraska Agricultural Experiment Station, Lincoln, Nebraska.)

Publication approved by Nebraska Agricultural Experiment Station.

The effectiveness of various treatments in the control of western snowberry (buckbrush). Wood, H. E. Rod sq. plots of grassland in Winnipeg heavily infested with western snowberry (Symphoricarpos occidentalis Hook) were knapsack sprayed June 11 when the snowberry was in the pre-bud stage. The following herbicides were applied 1 lb/A in 50 imperial gal. water: 2,4-D butyl ester, emulsifiable acid of 2,4-D (ACP-638), low volatile ester (LV4), low volatile 2,4,5-T (1184 EB), 2,4,5-T (Propon 4) and Kuron (Silvex). Final appraisal in late August indicated a high degree of control on all plots (the low volatile ester showed considerable regrowth from new lateral shoots). A more accurate appraisal will be made in June, 1955. Nearby plots treated in 1953 and given final appraisal in 1954 indicated the following in western snowberry control: comparable results from 2,4-D and 2,4,5-T; 1-1/2 lb/A gave 100% kill of top growth; July 1 application (or soon after full leafing) was slightly

superior to June 1 (pre-bud); almost without exception in the second season following treatment, some regrowth appeared from the lateral roots of the original plants; pasturage was greatly stimulated following removal of competing snowberry. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

No approval required for publishing.

CONTROL OF BRUSH ON ROADSIDES, UTILITY LINES AND OTHER RIGHTS OF WAY

Summary — R. H. Beatty

One abstract was received for inclusion in this section. It deals with Amizol on brush.

Abstract

The effectiveness of Amizol on mixed brush, Meyers, W. A. Application of Amizol was made on mixed brush in July, 1953. Rates used were 3, 6 and 12 pounds acid equivalent per 100 gallons of water. All plots were sprayed to the point of run off with no attempt being made to spray the ground. Height of brush averaged 4 to 6 feet in height and approximately 200 gallons of solution per acre was applied.

Results: No apparent effect was observed during the summer of 1953 on any plants treated except poison ivy. The poison ivy was completely dead on all plots by September, 1953. Black oak (Quercus velutina), white ash (Fraxinus americana) and Mockernut hickory (Carya tomentosa) showed complete albinism at all rates when the new leaves appeared in May, 1954.

Subsequent die back and death occurred on these species at the 6 and 12 pound rate. Some plants recovered at the 3 pound rate of application. Sumac (Rhus glabra), red maple (Acer rubrum) and Sassafras (Sassafras albidum) were stunted but recovered by the fall of 1954 on all plots. (Contributed by Agr. Div., American Chemical Paint Company, Ambler, Pa.)

CONTROL OF POISONOUS WOODY PLANTS, ALTERNATE HOSTS, AND OTHER WOODY PLANT PROBLEMS

Summary — J. E. Kuntz

No abstracts were submitted for inclusion in this section.

CONTROL OF WOODY PLANTS IN FORESTS, TREE PLANTATIONS AND FARM WOODLANDS

Henry L. Hansen

Summary

Interest in the use of chemicals for controlling undesirable woody plants in forestry operations continues to increase as evidenced by the number of reports received and by the generally optimistic tone of the results. It is true that many forestry investigations do not produce worthwhile data in less than several years time and some projects initiated 3 to 7 years ago are now becoming fruitful.

Three main lines of investigative activity have apparently been of most concern to foresters. The first has been directed toward the interest in using chemicals to control undesirable woody plants for the purpose of encouraging natural regeneration of desirable conifers and to release established plantation trees from competition. This year's reports continue to indicate good success in this direction using 2,4-D and 2,4,5-T at about 1-2 pounds per acre in water in foliage sprays. Such treatments have been demonstrated to result in an increase in natural conifer regeneration, in greater height growth of the conifers released, and in their generally better survival.

A second major line of investigations has been in the use of aerial sprays for forestry purposes. A considerable amount of information is now at hand particularly from Minnesota and Michigan trials going back as early as 1951. In general, these trials have indicated (1) a considerable variation in results which are often hard to explain, (2) that at least under some treatment conditions very effective release of conifers can be obtained by proper aerial sprays, (3) that scrub oak (northern red, bur, white and northern pin oaks), quaking aspen and paper birch have under some conditions been successfully controlled for the release of conifer understories, and (4) that aerial applications have been demonstrated to have considerable promise for cheap and reasonably effective forest release purposes.

There has also been a considerable interest in attempting to more accurately determine the tolerance of conifers to the various chemical treatments. Reports from Michigan and Minnesota indicate that ordinary rates of application of 2,4-D and 2,4,5-T are seldom a cause of mortality to conifers unless applied before mid season. As a matter of fact the tolerance of conifers in post mid season condition permits the use of far more severe than ordinarily recommended treatments. Jack pine and Norway spruce were reported as being the most sensitive species of all those tested.

There appears to be a continued need for more systematic and extensive tests of different treatments of large trees for eradication rather than control purposes. Comparisons of dormant with growing season applications on a more extensive scale are needed. The relative efficacy of the different chemicals including the non-selective formulations is in need of more systematic comparison.

The abstract contributors are to be commended for having had a very productive year of effort.

Abstracts

Effects of season in Michigan on control of hardwoods with frill girdles and 2,4,5-T. Arend, John L. Frill girdle experiments to control unwanted hardwoods with esters of 2,4,5-T were started in lower Michigan during 1951. Species treated included white, red, black, and northern pin oaks, red maple, aspen, sassafras, beech, ironwood, blue beech, sugar maple, elm, and box elder. Stems were frill girdled at heights of about 2 ft., although some were made ground level. Comparative effects of 2,4,5-T esters mixed with water (8 lb. ahg. or 2% by volume) and with #2 diesel oil (4 lb. ahg. or 1% by volume) were tested.

Three-year results show that (1) the tops of all species treated with 2,4,5-T in oil carrier were killed, except some box elder, regardless of the season of treatment. On the other hand, the tops of about 1/2 of the trees treated during the winter with the 2,4,5-T in water were still living although nearly all trees were killed when treated in this manner during the summer and fall, (2) nearly all trees with dead tops treated with the water mixture developed sprouts regardless of the season of treatment. About 1/2 of the trees treated with the oil mixture during the dormant season developed sprouts. Only about 1/3 of the trees treated with oil mixture during the summer and fall developed sprouts. The chemical and oil mixture in frills made at ground level further reduced sprouting. From these tests it appears that frill girdling with 2,4,5-T esters in oil during the summer and fall in lower Michigan will result in better control of hardwoods with less vigorous sprouting than at other seasons of the year. (Lake States Forest Experiment Station, East Lansing, Michigan.)

Some effects of 2,4-D and 2,4,5-T ester foliage sprays on conifers. Arend, John L. Desirable conifers often occur with hardwood trees and brush which can br controlled with herbicides as foliage sprays. To test their relative tolerance to 2,4-D and 2,4,5-T, a series of simulated aerial sprays were applied to 6 locally planted conifers. Eight mixtures of 2,4-D and 2,4,5-T esters in fuel oil and water were applied at 1-day intervals, June 8 to August 17, 1954. The species were (1) white pine (Pinus strobus), (2) jack pine (P. banksiana), (3) red pine (P. resinosa), (4) Scotch pine (P. sylvestris), (5) Norway spruce (Picea abies), and (6) white spruce (P. glauca). The conifers, although 13 to 15 years old, were only 3 to 8 ft. in height because of suppression by an overstory cover of oak. The herbicidal mixtures and rates per acre tested were:

(1) 1 qt. 2,4-D ester (Esteron 10-10), 15 qt. water, 4 qt. #2 fuel oil = 5 gal/A
(2) 1 qt. 2,4-D ester, 7 qt. water, 2 qt. #2 fuel oil = 2½ gal/A
(3) 2 qt. 2,4-D ester, 14 qt. water, 4 qt. #2 fuel oil = 5 gal/A
(4) 2 qt. 2,4-D ester, 6 qt. water, 2 qt. #2 fuel oil = 2½ gal/A
(5) 1 qt. 2,4,5-T ester (Esteron 245), 15 qt. water, 4 qt. #2 fuel oil = 5 gal/A
(6) 1 qt. 2,4,5-T ester, 7 qt. water, 2 qt. #2 fuel oil = 2½ gal/A
(7) 2 qt. 2,4,5-T ester, 14 qt. water, 4 qt. #2 fuel oil = 5 gal/A
(8) 2 qt. 2,4,5-T ester, 6 qt. water, 2 qt. #2 fuel oil = 2½ gal/A

None of the conifers were killed but the 1954 needles of all species were damaged by the herbicidal treatments during the period of active growth. After the middle of July white spruce showed little apparent damage from the herbicides tested while jack pine and Norway spruce showed some needle browning following treatments up to the middle of August. The other conifers showed no apparent injury from the herbicide after August 1 treatments. During the early part of the growing season 2,4-D was more damaging to the new foliage than 2,4,5-T. There were no outstanding differences in damage as the result of varying concentrations and rates of application per acre. From this experiment it appears that most conifers in northern lower Michigan can be treated in brush control and release operations during August.

with foliage sprays of 2,4-D and 2,4,5-T esters at rates of 2 lb. of acid in 5 gal. water/A without serious damage. (Lake States Forest Experiment Station, East Lansing, Michigan.)

Foliage sprays for maple sprout clumps. Day, Maurice W. Foliage sprays in water were applied to sprout clumps of red maple (Acer rubrum), hard maple (Acer saccharum) and mountain maple (Acer spicatum) using 3 different solutions: (1) Propylene glycol butyl ether ester of 2,4,5-T (Esteron 245); (2) Propylene glycol butyl ether ester of Silvex [2-(triclorophenoxypropionic) acid], (Kuron); (3) Propylene glycol butyl ether esters of 2,4,5-T and 2,4-D in equal parts (Brushkiller). They were applied at the recommended concentration of 3 lbs. ahg. with sufficient volume to wet the leaf surfaces. Sprout clumps are dense and it is difficult to secure good coverage with hand equipment. Better coverage would be attained with high pressure equipment. Treatment was made in mid-July and a month later the results were judged. The first treatment resulted in erratic degrees of kill varying from nearly complete leaf kill to only moderate injury. The second treatment showed a more complete kill on all three species and in most cases gave a complete leaf kill. The third treatment gave results similar to the first but the degree of leaf kill was not quite as great. A further check of the clumps after 3 months indicated the same relative results. The second treatment appeared clearly superior but some green tissue was still present and examination next year will be necessary to determine the degree of resprouting. Since these species are normally quite resistant to foliage sprays the results are encouraging. (Contribution of Michigan Agricultural Experiment Station, East Lansing, Michigan.)

Eradication of scrub oak to prevent the local spread of oak wilt. Drake, C. R. and J. E. Kuntz. The oak wilt fungus moves through root grafts from tree to tree in dense stands of oak. "Barriers" of trees poisoned by sodium arsenite have prevented such spread. Root kill is essential. The effectiveness of other less toxic herbicides in eradicating northern pin oaks (Quercus ellipsoidalis, 4 to 6 inches, dbh) has been tested (see NCWCC Res. Rpts. 1950, 1952, and 1953). While generally accepted treatments using 2,4-D, 2,4,5-T, and ammate gave good top kill, many produced only limited root injury. Variable sprouting from surviving roots and root collars followed. Already some sprouts have become affected with oak wilt. 3-(p-chlorophenyl)-1,1-dimethylurea (CMU), applied in 1952 to the ground as water suspensions or as rapidly disintegrating pellets at 50, 100, and 200 lb/A, killed or severely injured most oaks within 25 feet of the treated area. Many of the severely injured trees and their sprouts died in 1953. Additional sprouts died in 1954. Lower rates caused much less injury, although trees bordering rototilled firelanes (without accumulated humus) treated with CMU at 20 lb/A showed considerable injury. White and bur oaks, however, showed injury only on scattered branches. Hence, CMU showed considerable promise in controlling oak wilt. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Co.)

Tests of MCP; 2,4-D and 2,4,5-T on prickly ash (Xanthoxylum americanum) in Minnesota. Hansen, H. L. During 1953, tests were run in Scott County, Minnesota, to compare several herbicides for their value in the control of prickly ash, a common woody weed in farm woods and pastures in Minnesota. The plots were inspected several times during the subsequent 1954 growing season and a final evaluation made on October 18, 1954. The nature of the treatments and evaluation of results is listed in the following table:

Treatment Variations

Date Treated	Application	Concentration	Relative Effectiveness1/
Nov. 24, 1953	basal	MCP, butyl ester 14 lb. AHG in oil	good
Nov. 24, 1953	basal	2,4-D (butyoxy ethanol ester) 14 lb. AHG in oil	good
Nov. 24, 1953	basal	2,4,5-T (butoxy ethanol ester) 14 lb. AHG in oil	satisfactory
Aug. 17, 1953	cut stumps	2,4-D (butoxy ethanol ester) 4.8 lb. AHG in water	satisfactory
Aug. 17, 1953	cut stumps	2,4,5-T (butoxy ethanol ester) 4.8 lb. AHG in water	satisfactory
Aug. 17, 1953	cut stumps	MCP, butyl ester 4.8 lb. AHG in water	satisfactory
Aug. 17, 1953	general foliage	2,4-D (butoxy ethanol ester) 4.8 lb. AHG in water	poor
Aug. 17, 1953	general foliage	2,4,5-T (butoxy ethanol ester) 4.8 lb. AHG in water	good
Aug. 17, 1953	general foliage	MCP, butyl ester 4.8 lb. AHG in water	satisfactory

1/ Good - less than 10 per cent of stems resprouting
Satisfactory - 11 to 25 per cent resprouting
Poor - over 25 per cent resprouting
(School of Forestry, Minn. Agr. Expt. Station, Minn. State Dept. of Agr. Dairy and Food, and the American Chemical Paint Co.)

Use of aerial sprays to release conifers from oak and aspen competition. Hansen, H. L. and E. J. Jankowski. Beginning in 1951 a number of tests have been made of aerial spray applications where natural stands or plantations of various conifers have needed release from overtopping, undesirable hardwoods especially oak and aspen. The nature of treatments applied and the results obtained in terms of the effectiveness in killing the oaks and aspen is summarized in the table. In all cases the silvicide used was a 50:50 mixture of the propylene glycol butyl ether esters of 2,4-D and 2,4,5-T. Only tests on which at least one full year of observation following treatment is available have been included.

Date Sprayed	Application Per Acre	Effectiveness 1/ Oak 2/	Aspen
Aug. 22, 1951	1 lb. in 3 qts. #2 fuel oil	good	poor
Aug. 22, 1951	2 lb. in 6 qts. #2 fuel oil	good	poor
Aug. 22, 1951	4 lb. in 3 gal. #2 fuel oil	good	partial
Aug. 19, 1953	1 lb. in 2 gal. water	--	poor
July 28, 19533/	2 lb. in 4 gal. water	--	good
July 28, 19533/	1 lb. in 2 gal. water	--	good
July 28, 1953	1.6 lb. in 4 gal. water	--	good
July 28, 1953	1.6 lb. in 4 gal. water	--	partial
July 29, 1953	1 lb. in 2 gal. water	partial	poor
Aug. 19, 1953	1 lb. in 2 gal. water	partial	poor

1/ good = over 75% kill, little resprouting poor = less than 50% kill, abundant resprouting

2/ "Scrub" oak including bur oak, northern pin oak and northern red oak. Of these, the bur oak seems most easily killed.

3/ Both plots had considerably less than the indicated 4 and 2 gal. per acre because of drift spreading the volume over an area almost 3 times the intended plot size. A kill varying from 25 to 70 per cent was noted over the drift area.

Basal and cut surface applications of 2,4-D and 2,4,5-T on box elder, red oak and cottonwood. Hansen, H. L. and R. P. Leinfelder. A six acre tract covered primarily with northern red oak, bur oak, box elder and eastern cottonwood was treated to prepare the area for conversion to a pine plantation. The tract was subdivided into plots and given the following treatments: (trees in plots A, B, C, and D were basally girdled and the 2 foot girdled band sprayed).

Plot A. Trees girdled and sprayed August 1953 using 2,4-D (butoxy ethanol ester) at 25 lbs. AHG diesel oil and felled in January.
Plot B. Trees girdled and sprayed August 1953 using 2,4,5-T (butoxy ethanol ester) at 15 lbs. AHG diesel oil and felled in January.
Plot C. Trees girdled and sprayed November 1953 with 2:1 mixture of 2,4-D and 2,4,5-T butoxy ethanol esters at 15 lbs. AHG diesel oil. Trees not felled.
Plot D. Trees girdled and sprayed December 1953 with 2,4-D (butoxy ethanol ester) at 25 lbs. AHG diesel oil. Trees not felled.
Plot E. Trees felled and 2,4-D (butoxy ethanol ester) applied to entire cut stump in December 1953.

All plots were rechecked in July and October 1954 and counts made on tree mortality and resprouting. Results are summarized in the following table.

Per cent of Total Number of Trees Resprouting

Plot	Oak	Boxelder	Cottonwood
A	100	80	--
B	88	23	--
C	50	0	--
D	94	0	0
E	80	--	100

Results seem to warrant the following conclusions:
1. Complete eradication was achieved on box elder by spraying either 2,4-D or the mixture of 2,4-D and 2,4,5-T on the girdled trees in Nov. or Dec. and allowing them to stand through the next growing season.
2. 2,4,5-T gave distinctly better results than did 2,4-D when applied to oak and boxelder which was cut the winter following treatment.
3. In general, best results were obtained when trees were girdled, sprayed and left standing.
4. Dormant season applications to cottonwood stumps resulted in profuse suckering from the roots while no suckering resulted from treatment of girdled trees left standing.

(Contribution from the School of Forestry, Minnesota Agricultural Experiment Station, St. Paul, Minnesota, and the Northwest Paper Co., Cloquet, Minnesota.)

Tolerance of conifers to various applications of 2,4-D and 2,4,5-T in Minnesota. Leinfelder, R. P. and Hansen, H. L. In August 1954 a survey was conducted in northern Minnesota to ascertain the nature and extent of injury to young coniferous trees resulting from various applications of 2,4-D and 2,4,5-T on roadsides, powerlines, experimental plots, and aerial sprays. From July 22 to August 21, 1953, a series of foliage spray roadside tests were conducted by the Minnesota Highway Department using various applications of 2,4-D; 2,4,5-T; and combinations of the two as follows:

Date	Pounds AHG 2,4-D	2,4,5-T	Rate/Acre Lbs. Acid	H_2O Gal.	Date	Pounds AHG 2,4-D	2,4,5-T	Rate/Acre Lbs. Acid	H_2O Gal.
7/22	4	0	3.5	88	8/19	2.6	2.6	2.4	46
7/22	8	0	7.4	96	8/19	4	4	3.7	46
7/22	2	0	1.6	82	8/19	2.6	2.6	1.5	29
8/18	4	4	4.8	60	8/19	0	2.6	1.4	52
8/18	2	2	2.3	57	8/20	3.4	3.4	2.4	36
8/18	4	4	3.6	46	8/20	3.4	3.4	2.1	32
8/18	4	4	1.7	22	8/21	5.2	2.6	3.3	42
8/18	1	1	2.1	55	8/21	4	4	2.7	34
8/19	1	1	1.2	32	8/21	2.4	2.4	1.6	21

Numerous conifers of several species varying from 6" to 12" in height were inspected for evidence of spray injury. Black spruce, balsam fir, and eastern white pine showed no visable effects. Red pine showed occasional needle dystrophy. Northern white-cedar occurred only on the 2,4-D plots and showed no sign of injury.

Seven other areas on which various spray applications had been made were checked and results summarized in the following table. All sprayings used 50/50 2,4-D and 2,4,5-T ester formulations except #2 on which only 2,4-D was used

	Date	Species	AHG	Rate/Acre	Conifer Injury
1.	8/7/52	white pine	2	4 lbs. and 190 H_2O gal.	8% mortality
2.	7/19/49	black spruce	-	1 lb. and 20,40 and 60	no effect on established trees
		white pine	-	gal. H_2O	heavy mortality on 1-2 yr. seedlings
3.	Mid-summer '54	white pine	12	drenching	yellowing, 40-60% leader killing and twisting
		red pine	12	drenching	needle dystrophy and 40-60% leader dieback
		jack pine	12	drenching	needle kill and browning, leader dieback 80%
		balsam fir	12	drenching	curling and defoliation of new growth
		tamarack	12	drenching	complete defoliation
4.	7/28/53 1/	jack pine	40	1.6 lbs. and 4 gals. H_2O	less than 10% mortality, no effect on '54 mortality
		red pine	40		no effect except needle dystrophy on '53 growth
		white spruce	40		no effect
5.	7/28/54 1/	jack pine	1.5	2 lbs. 2 qts. oil, 4 qts. H_2O	40-60% of needles mottled reddish brown
6.	8/6/54 1/	jack pine	40	1.6 lbs. and 4 gals. H_2O	30-60% of needles mottled reddish brown
		red pine	40		needle dystrophy only, 50% of trees
7.	7/20/54	white pine	2	6 lbs. and 300 gals. H_2O	no effect except needle dystrophy
		red pine	2		no effect except needle dystrophy

1/ Aerial spraying.

From the preceding data several conclusions seem evident.

1. Little or no mortality will occur on white spruce, black spruce, balsam fir, white pine, and red pine where applications of less than 4 pounds of 2,4-D and 2,4,5-T per acre are made after mid-July to well established trees.

2. Jack pine appears to be the most sensitive of the conifers examined. Rates of 2 pounds per acre or more are apt to result in significant mortality.
3. Several species show characteristic symptoms of spray effects such as needle yellowing in white pine, defoliation and curling of current growth in balsam fir, and browning and dieback of current year needles of jack pine.
4. Within the indicated ranges, 2,4-D and 2,4,5-T are safe to use in connection with the release of established seedlings of the above mentioned species.

(Minn. Agr. Exp. Sta., St. Paul, Minn. and Dow Chemical Co.)

Controlling scrub oak with 2,4,5-T aerial sprays in Michigan. Ralston, R. A. and Coulter, L. L. Effective chemical aerial spray methods for eliminating scrub oaks to release more valuable conifers will mean a great saving in time and manpower on timber stand improvement operations. On August 28, 1952, two 4.0-acre plots (2x20 chains) were flown in a stand of scrubby white, red, and northern pin oaks with scattered bigtooth aspen and jack pine over-topping a 15-year-old red pine plantation. The overstory averaged 60 sq. ft. of basal area and the oaks ranged from 10 to 50 ft. in height and 1 to 12 in. dbh. The red pine were 4 to 8 ft. in height; healthy but making slow growth in dense oak shade. The herbicide used was the propylene glycol butyl ether ester of 2,4,5-T (Esteron 245) in an oil-water emulsion. The treatments were: (A) 1 lb. (1 qt.) 2,4,5-T in 4 qt. #2 fuel oil and 15 qt. water applied at the rate of 5 gal/A or 1 lb. acid equivalent /A and (B) 2 lb. (2 qt.) 2,4,5-T in 4 qt. #2 fuel oil and 14 qt. water applied at the rate of 5 gal/A or 2 lb. acid equivalent/A. On August 10-12, 1953, additional but larger-scale tests were made in a similar stand using 1 lb (1 qt.) 2,4,5-T in 2 qt. #2 fuel oil and 7 qt. of water at the rate of 2.5 gal/A or 1 lb. acid equivalent/A. Results 2 complete growing seasons after the first test and 1 growing season after the second test are in agreement and show: (1) most oaks are defoliated completely and show few signs of life; about 10% have some live foliage on lower branches and stems but this new growth appears to be dying the second year after treatment; oak sprouting has been negligible but oak and other hardwood and pine seedlings are starting to show up in the ground cover; (2) no apparent injury to the pines sprayed in August, which are now growing free of overhead shade; indications are that pines are susceptible to the chemical used if foliage spraying is done during the active growing season; (3) control of scattered clumps of aspen was spotty; the tops of some trees are dead while others are apparently less affected; additional mortality is expected however; small trees appear to be more affected than larger ones; aspen suckering was not retarded; (4) no important differences between treatments have been noted; (5) according to these tests effective control of scrub oak in northern lower Michigan can be obtained without injury to suppressed pine with aerial sprays of 1 lb. (1 qt.) 2,4,5-T/A ester in an oil-water emulsion applied at the rate of 2.5 gal/A at a total cost as low as $3.50/A. (Lake States Forest Exp. Sta., East Lansing, Michigan, and Dow Chemical Co., Midland, Michigan.)

Spraying hazel with herbicides aids establishment and growth of pine reproduction. Roe, Eugene I. In early September, 1947 and in late June, 1948, twentieth-acre plots of moderately dense hazel underneath a mature red pine-white pine stand on the Chippewa National Forest were given foliage sprays with 2,4-D or with ammate. The object was to kill back the brush and thus encourage the development of a pine seedling stand to replace the old timber which is almost ready for the final cut. Treatments used were 4 lb. of the ammonium salt of 2,4-D in 40, 80, and 120 gal. of water solution/ acre and 80 lb. of ammate / acre applied in the same volumes. Each treatment was applied to 2 plots in September and to 2 others in June. An examination made in August 1954, seven growing seasons later, shows that the spraying has been of considerable benefit. Not only have many new seedlings become established, but many of those which had been overtopped by the brush have been freed to make increased growth. The sprayed plots now have 24 to 160% more

seedlings than before treatment, compared to a gain of only 2% on the unsprayed plots. The largest increases have been made by the plots sprayed with 2,4-D in June and September, 160 and 60% respectively. An even better showing has been made by the plots sprayed with ammate, but on these there was so much mortality of the pine seedlings resulting from the chemical that the net gains average only 24 and 40%. Since many of the larger trees were killed by the herbicide, the average height of all pines on the ammate plots is no different from that of the pines on the check plots. On the 2,4-D plots, however, the pine seedlings are 0.3 ft. (September) to 0.6 ft. (June) taller than those on the unsprayed plots. The superiority of the plots sprayed with 2,4-D in June is further shown by the fact that the hazel on these plots, although originally no lighter than that on the other plots, is now very light in density and averages only 2.1 ft. in height. As a result, only 21% of the pine seedlings on the June 2,4-D plots need release from overtopping hazel compared to 58% of those on the unsprayed plots. Release need on the plots of the other treatments (September ammate, June ammate, and September 2,4-D), on which the brush although averaging about a foot shorter is about as dense as that on the unsprayed plots, ranges from 41 to 46%. (Lake States Forest Experiment Station, Grand Rapids, Minnesota.)

Herbicide spraying very effective in freeing pines from overtopping brush. Roe, Eugene I. In mid-June, 1951, a tenth-acre plot on the Chippewa National Forest consisting of dense large-tooth aspen and brush overtoppint 2-year old natural jack pine seedlings and newly planted red pine was sprayed with a 50-50 mixture of the isopropyl ester of 2,4-D and the propylene glycol butyl ether ester of 2,4,5-T in water solution, 1.84 lb. ahg or 0.65 lb./a. The object was to release the pines from overhead competition by killing back the aspen suckers, hazel, willow, and cherry (Roe, 1952 Report, p. 71). An examination made after four growing seasons shows that although the brush has more than recovered its original density of 12,000 stems/acre, the aspen has been practically eliminated (6200 vs. 1200 stems). As a result of the set back given the competitors the pines have been greatly benefited. Only 24 percent of the jack pine and 11 percent of the red pine now need release compared to 83 percent of the jack pine on the adjacent unsprayed area. Height growth has also been improved, the jack pine on the sprayed plot averaging over one-half foot taller than those on the unsprayed area. Survival of the jack pine also is 7 percent greater on the sprayed plot. The spraying, however, caused appreciable loss in red pine, about 15 percent of the planted trees dying from spray injury. Such loss can likely be prevented by spraying overtopping brush later in the season when the planted pines have completed their growth. (Lake States Forest Experiment Station, Grand Rapids, Minnesota, in cooperation with the Chippewa National Forest.)

Aerial spraying to release planted spruce from overtopping hardwoods. Roe, Eugene I. In early August 1953, three ten-acre plots on the Superior National Forest near Grand Marais, Minnesota, were sprayed from the air in an attempt to kill overtopping paper birch and aspen which were greatly reducing the growth of a white spruce plantation. Herbicides used were the propylene glycol butyl ether esters of 2,4-D at the rates of 1 pound and 2 pounds of acid and of 2,4,5-T at 1 pound per acre respectively. All were applied in a 1-1-6 or 2-1-5 herbicide-diesel oil-water emulsion at approximately 2 gallons per acre. An examination made in July, 1954, showed very promising results, particularly with paper birch. In this species, which averaged 30 feet in height and 4 to 5 inches in diameter, 70 to 100 percent of the trees were either killed or severely defoliated. As a direct result, 80 to 85 percent of the planted spruce had been given considerable additional light and should show a great increase in growth. Where aspen is the dominant hardwood, no such benefit was obtained. Injury to this species was slight, 75 to 100 percent of the trees being less than 20 percent defoliated. No herbicide injury occurred to the spruce on any of the three treatments. (Lake States For. Exp. Sta., Grand Rapids, Minnesota, in cooperation with the Superior National For. and Dow Chemical Co.

CHEMICAL DRYING AND PRE-HARVEST WEED CONTROL

Summary W. M. Phillips

Six abstracts from three states were received. Two reports were concerned with drying field corn. Sorghum, alfalfa, edible field beans, and switchgrass each were the subject of one abstract.

Ham and Willard reported only small differences in moisture content of untreated corn and that treated with PCP and DNBP. Shafer found that several chemicals applied to corn reduced the moisture content more rapidly than natural drying. Shafer also reported considerable reduction in moisture content of grain sorghum after treatment with a variety of chemicals.

Phillips accomplished drying of alfalfa foliage with DNBP. Less effect was noted as a result of endothal and PCP applications.

Shafer and Hunck reported that applications of PCP, endothal, magnesium chlorate, and a sodium chlorate-soluble borate mixture aided in direct combining of edible field beans. Shafer used the same chemicals in addition to PCP, DNBP and sodium monochloroacetate on switchgrass being grown for seed. Addition of amino triazole to several of the water soluble materials increased their effectiveness. Considerable reduction in moisture content of the seed was reported.

Attempted preharvest dessication of corn by herbicides. Ham, G. F. and Willard, C. J. Ohio W64, a midseason corn, was treated on September 9 with PCP (Dow H916) and DNBP (Dow General) at 4 lb./A. in 80 gpa of kerosene. The moisture content of the grain on September 8 was 45% and leaves were still green. Moisture samples were obtained from quintuplicate plots on September 13, 17, 27, and October 11. The moisture contents at different dates after treatment were:

Moisture content of corn treated September 9
All figures averages from 10 plots

Dates	Treated		Not treated
	DNBP	PCP	
	Pct.	Pct.	Pct.
Sept. 13	45.0	47.0	46.4
Sept. 17	36.9	37.0	37.8
Sept. 27	26.9	27.1	29.0
Oct. 11	21.6	21.1	23.0

These differences between treated and untreated, if significant at all, which has not been determined, are not sufficient to justify treatment in order to hasten drying. (Contribution of the Ohio Agricultural Experiment Station)

Chemical drying of alfalfa as an aid in seed harvest. Phillips, W. M. Square rod plots of alfalfa were treated September 13, 1954 with dinitro-o-sec butylphenol at 1, 2, and 3 pts./Ac. (0.67, 1.25, and 1.87 lbs.) applied in 10 gallons of diesel fuel and 2 pts./Ac. applied in 5 gallons of diesel fuel, pentachlorophenol at 2, 4, and 6 lbs./Ac. applied in 10 gallons of diesel fuel and endothal at 4, 6, and 8 qts./Ac. applied in 10 gallons of water. Five days after treatment samples of the alfalfa foliage were taken and dried in an electric oven. Foliage from the no-treatment plots averaged 61.3% moisture. PCP reduced the moisture approximately 10%. Rate of application had little affect on the results obtained. Increasing rates of dinitro gave increasingly drier foliage with the 3 pint application resulting in moisture content of the hay of 31%, 2 pints in 10 gallons of

oil had 38.8% and the 2 pints in 5 gallons of oil - 40.5%. Eight quarts of endothal gave results nearly equal to 3 pints of dinitro. The 6 quart application of endothal resulted in foliage with 36.7% moisture and the 4 quart application dried the material to only 44% moisture. No yields were taken but it was judged that those plots which had 35% or less moisture were suitable for direct combining without further drying. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.)

Chemical drying of hybrid corn. Shafer, N. E. Preliminary screening trials were carried out on a field of hybrid corn using seven different chemicals with and without the addition of 1/4 lb. amino triazole. Using a spray volume of 7.5 gallons per acre, two acre plots were sprayed with an airplane when the corn averaged about 35% moisture. Treatment was made September 10 and first moisture samples were taken September 17. At that time the untreated check showed approximately 33% moisture compared to 26.18% for the best chemical treatment which was 4 qts. of magnesium chlorate. All other treatments gave moisture percentages in the range of that of the check, varying from 29.69% up to 33.34%. Moisture samples taken September 23 revealed 2 qts. of PCP to have given the lowest moisture at 22.02%. Ten lbs. of Chem-frost plus amino triazole had reduced moisture to 23.07%, 2 qts. of magnesium chlorate plus amino triazole resulted in 23.22% moisture, and 4 qts. of magnesium chlorate alone gave 23.82% moisture. The untreated check meanwhile had dropped to 26.34%. Most of the other treatments were below the check at around 25% moisture. This preliminary trial indicates that some chemical treatments were able to reduce the moisture content more rapidly than natural drying, at least during the two week period following application. The best treatments appeared to be 7-10 days ahead of the untreated corn in respect to moisture loss. Differences between treated and untreated areas began to diminish as moisture content approached 20%. Good drying weather prevailed during the two week period following treatment with the average maximum temperature 83, the average minimum 58, and with only .37 inch of rain on the 16th. (Contribution Department of Agronomy, University of Nebraska, Lincoln, Nebraska.)

Use of chemical desiccants with and without amino triazole for drying grain sorghum. Shafer, N. E. Two acre plots of Martin variety were sprayed by airplane using a spray volume of 7.5 gallons per acre. Treatments were applied September 22 at which time moisture content of the grain was approximately 20%. Moisture samples were taken on September 29 by cutting the plants at approximately the height that would be taken by a combine. This usually resulted in about 2 feet of stalk being harvested plus 3 or 4 leaves and the head itself. An additional sample of just grain alone was taken in the untreated check plot. The combine height sample averaged 38% moisture and the grain sample averaged 18% moisture. This relationship was used to convert the moistures obtained in the treated plots also. Treatments and converted moisture percentages were as follows:

2 pts. DNBP (Dow general) in diesel fuel - - - - - - - - - - - - -	faulty application
4 pts. DNBP (Dow general) in diesel fuel - - - - - - - - - - - - -	9.41%
4 qts. PCP (44%) in diesel fuel - - - - - - - - - - - - -	12.18%
6 qts. PCP (44%) in diesel fuel - - - - - - - - - - - - -	10.74%
4 qts. Endothal in water - - - - - - - - - - - - - - - - -	15.75%
8 qts. Endothal in water - - - - - - - - - - - - - - - - -	14.39%
4 qts. magnesium chlorate (Magron) in water - - - - - - - - - - -	13.19%
8 qts. magnesium chlorate (Magron) in water - - - - - - - - - - -	11.21%
10 lbs. sodium chloroacetate (Dow defoliant) in water - - - - - -	14.62%
10 lbs. sodium chloroacetate + 1/4 lbs. amino triazole in water -	11.21%
20 lbs. sodium chloroacetate in water - - - - - - - - - - - - - -	15.40%
4 qts. magnesium chlorate + 1/4 lb. amino triazole - - - - - - -	11.18%

10 lbs. sodium chlorate + soluble borates (Chem-frost) + 1/4 lb. amino triazole	13.11%
Untreated check area	18.20%

While the above figures are not the actual moisture percentages of the grain itself it does show the relative effectiveness of the various chemicals in comparison to the untreated check area. (Contribution Department of Agronomy, University of Nebraska, Lincoln, Nebraska.)

Chemical desiccation of switchgrass (Panicum virgatum L.) being grown for seed production. Shafer, N. E. Switchgrass in 40" rows was laid out in plots one row wide and 20 feet long. Chemical treatments were applied in triplicate using a three nozzle boom applying 20 gallons of solution per acre. Chemicals and rates of application per acre were as follows: 44% PCP 2 qts. and 4 qts; Magron (magnesium chlorate) 2 qts. and 4 qts.; DNBP (Dow general) 1 pt. and 2 pts.; sodium chlorate + soluble borates (Chem-frost) 10 lbs. and 20 lbs.; endothal 4 qts. and 6 qts.; sodium monochloroacetate (Dow defoliant) 10 lbs. and 20 lbs. In addition, 1/4 lb. per acre of amino triazole was added to each of the four water soluble materials (Magron, Chem-frost, Endothal, and Dow defoliant). The lowest rate given above was used where amino triazole was added. The amino triazole used was a product 50% by weight active ingredient plus wetting agent. Where amino triazole was not used 0.5% wetting agent was added to the spray solution in order to obtain a measure of the added effect due to amino triazole alone. The five best treatments and moisture percentages of harvested seed were (1) 4 qts. Magron 9.86%, (2) 10 lbs. Chem-frost + amino triazole 10.77%, (3) 20 lbs. Chem-frost 11.91%, (4) 2 qts. Magron + amino triazole 13.82% and (5) 20 lbs. Dow defoliant 15.31%. Moisture in the check plots averages 25.54%. Effectiveness of Magron, Chem-frost, and Dow defoliant was markedly increased by the addition of amino triazole. No increase was noted with endothal. PCP and DNBP resulted in moisture content from 17 to 21% indicating higher application rates would be needed. Germination tests will be made after the usual storage period. (Contribution Department of Agronomy, University of Nebraska, Lincoln, Nebraska.)

Chemical drying as an aid to direct combining edible field beans. Shafer, N. E. and Gene Hunck. Preliminary trials involving specially adapted combine equipment and chemical desiccants were undertaken at the Scottsbluff Experiment Station in 1954. First trials at direct combining showed most difficulty with the tough green vines but no difficulty in shelling the beans from the pods. Four row plots 300 feet long were laid out and sprayed on the afternoon of September 14. The following treatments were applied at a volume of 20 gallons per acre: 1 gal. PCP (40%) in diesel fuel; 6 qts. endothal; 4 qts. magnesium chlorate (Magron); and 20 lbs. sodium chlorate-soluble borate mixture (Chem-frost). Following a very light shower that evening several rows on either side the sprayed plots were cut with a conventional cutter. These cut rows were windrowed the morning of the 16th. Combine harvesting began the afternoon of the 17th with the windrowed area. Considerable difficulty was experienced in threshing the windrows because the vines were still tough and green. The sprayed plots were then harvested by the direct method without difficulty. Bean samples showed no differences in moisture content. Plant samples were drier from the treated plots as indicated by the actual combining results. (Contribution Departments of Agronomy and Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.)

New Herbicides

W.C. Dutton

Summary

A total of 80 abstracts on 13 so-called new herbicides was received. An attempt has been made in this summary to present concise statements of results without interpretation. It has not been possible to give detailed statements of methods, conditions and results. Information of this sort can be obtained from the abstracts themselves which will be published under the heading of the weed or crop concerned.

2,3,6-Trichlorobenzoic Acid (1 report) used as the acid and the sodium salt at 1 and 2 lbs. in a pre-emergence application on field corn caused no injury at either rate. Both rates of the acid and the low rate of the salt gave poor weed control. Two pounds of the salt gave fair control of weeds.

Isopropyl-N-(3-Methylphenyl)-Carbamate (T-516) (2 reports) at 2, 4 and 8 lbs. pre-emergence on corn was less effective than CIPC which gave mediocre to good control of grasses at 4 and 8 lbs. and poor broadleaf control. On sugar beets pre-emergence T-516 was partially effective with 10 lbs. giving 70% and 60% control of broadleaves and grasses respectively.

2-Chlorophenyl-N-(3-Chlorophenyl)Carbamate (T-595) (1 report) in a pre-planting treatment at 4 and 6 lbs. for wild oat control and crop effects gave no control of oats and had no effect on any of seven crops. IPC at the same rates gave 70% and 90% control of grasses with no effect on broadleaves. A post-emergence treatment at 4 and 6 lbs. gave 50% and 70% wild mustard control, stunted all crops, and had no effect on wild oats or foxtail.

Sesin (Sodium 2,4-Dichlorophenoxy Ethyl Benzoate) (3 reports) in pre-emergence treatment on corn at 2 and 4 lbs. (two formulations 30E and 50W) gave fair control of weeds. There was no statement of injury effects. It was used for the control of crabgrass in blue grass turf at 2, 4 and 6 lbs. Four and 6 lbs. in three applications gave promising results and 6 lbs. in one application with special watering gave good control without injury to blue grass. Strawberry plants were sprayed 3 weeks after setting and 3 later treatments at 6 weeks intervals at 6 and 12 lbs. Both rates gave excellent weed control without runner inhibition.

Natrin (Sodium 2,4,5-Trichlorophenoxy Ethyl Sulfate) (6 reports) was ineffective at 1 1/2 and 3 lbs. pre-emergence on sugar beets and stunted the beets and 2, 4 and 6 lbs. pre-emergence on soybeans reduced stand 30% and gave 60% control of grasses and 73% control of broadleaves. SES at 4 lbs. was more effective on weeds and less toxic to beans. Four applications on

strawberries starting 3 weeks after setting gave excellent weed control at 3 and 6 lbs., but there was some runner inhibition from 6 lbs. Broccoli and cabbage transplants were treated with 4, 6 and 8 lbs. at one week and 3 weeks after setting. All rates stunted plants and seriously reduced stand at one week but 4 lbs. at 3 weeks looks promising. Pepper and tomato transplants treated with the same rates and at same periods showed tomatoes to be very sensitive at all rates at both periods. Peppers were also sensitive at one week but 4 and 6 lb. at 3 weeks are promising. Pre-emergence treatments of 3 and 6 lbs. in canning peas gave poor weed and grass control.

Silvex (2(2,4,5-Trichlorophenoxy)Propionic Acid) (10 reports) was used as the PGBE ester pre-emergence at 1, 2 and 4 lbs. on corn. The low rates were ineffective and 4 lbs. gave fair to good grass and broadleaf control in comparison with very good control with the same ester of 2,4-D. The PGBE ester and amine salt used pre-emergence at 1/2, 1, 2 and 4 lbs. on soybeans gave 70% and 85% control respectively of grasses and braodleaves with no injury reported. Two pounds of 2,4-D PGBE ester gave the same degree of control and caused a slight reduction in stand. Trials in spring seeded alfalfa with the ester at 1/4 and 1/2 lbs. applied at pre-emergence, emergence, 1 week and 4 weeks all reduced stand and gave no weed control. One and 2 lbs. at emergence on potatoes in muck gave no significant weed control or yield reduction. Trials in canning peas included (1) ester at 2 and 3 lbs. pre-emergence, (2) amine salt at 3, 6 and 9 oz. post-emergence in early peas, and (3) amine salt at 3 and 6 oz. post-emergence in late peas. In (1) the peas were stunted and grass control was poor, and in (2) there was no control without injury and in (3) grass control was poor, broadleaf control fair and there was some injury to peas.

Pre-bud application of the PGBE and isooctyl esters on western snowberry showed a high degree of control in August. The PGBE ester at 3 lbs. on three species of maple sprout clumps gave better results than 2,4,5-T alone or in 50-50 mixture with 2,4-D. Aerial application was made in May to post oak of the ester at 1 1/2 and 2 lbs. per acre in comparison with 2,4,5-T at six locations. October observation showed greater initial top kill with silvex in three locations and results similar to 2,4,5-T in three.

Urea Compounds. Several reports were received on the newer urea compounds and the results from their use will be considered together, sometimes in comparison with CMU. The newer compounds on which reports were received are: 3-phenyl-1,1-dimethylurea (PDU) (2 reports), 1,1-dimethyl-3-phenylurea (Karmex FW) (6 reports), and 3-(3,4-dichlorophenyl)-1,1-dimethylurea (Karmex DW) (13 reports). CMU is 3-(p-chlorophenyl)-1,1-dimethylurea (Karmex W). PDU, Karmex DW and CMU at 1, 2 and 4 lbs. pre-emergence on corn all gave excellent weed control and only PDU at 4 lbs. damaged the corn. Karmex DW and CMU at 1/2 and 1 lb. pre-emergence on sugar beets were both ineffective at both rates for weed control and CMU at 1 lb. stunted beets for a short time.

Karmex DW and CMU at 1, 2 and 4 lbs. pre-emergence on soybeans in two experiments gave poor weed control at 1 lb. and very severe injury to beans at 2 and 4 lbs. in one location and at the other 2 lbs. gave good weed control but reduced stand of beans 27% (DW) and 63% (CMU). Karmex DW, Karmex FW and CMU at 1 and 2 lbs. worked into the soil to control wild oats gave insufficient control of oats and killed all or most of the field peas planted in the soil. Post-emergence treatments of 1 and 2 lbs. of Karmex DW and FW and CMU for the control of wild oats in field peas and flax gave limited control of oats at 2 lbs. which was very damaging to the crops. Karmex DW and CMU at 2 lbs. pre-emergence on onions on muck both gave good broadleaf control, neither gave good control of grasses and DW reduced onion yields. Karmex DW at 2 and 3 lbs. pre-emergence on canning peas gave excellent weed control but caused stunting and necrosis of peas. CMU gave fair to excellent weed control with less injury. Post-emergence applications on peas of Karmex DW at 1/2, 1, and 1 1/2 lbs. controlled neither grasses nor broadleaves without injury to peas. Karmex DW and CMU applied to strawberries three weeks after planting at rates from 1/2 to 2 lbs. caused injury and gave poor weed control at the lower rates and killed most of plants at higher rates.

For leafy spurge control Karmex DW at 50 lbs. gave 50% control with no injury to grass, Karmex FW gave 95% control and killed all grass and CMU controlled the spurge 90% and killed the grass. Applications of 30 lbs. of the three compounds for the control of field horsetail indicated Karmex FW to be the best, DW the least effective and CMU apparently intermediate. For the control of downy brome and hairy chess (2 1/2 inch stage) PDU at 4 lbs. gave 78% control, CMU at 3 and 4 lbs. gave 82% and 95% control and Karmex DW at 1, 2 and 3, 4 lbs. gave 60% or less control. In one experiment for control of quack or couch grass, DW, FW and CMU at 40 and 60 lbs. all caused yellowing and incomplete kill. FW and CMU at 40 and 80 lbs. both gave complete kill of top growth in another experiment.

4-C (4-Chlorophenoxy Acetic Acid)(12 reports) and 3,4-D (3,4-Dichlorophenoxy Acetic Acid (19 reports) were used, rather extensively, mostly on legumes (alfalfa, clover and peas) and in activity studies on weeds. An extensive experiment on alfalfa and red clover under oats indicated that (1) all of the phenoxy compounds applied at boot stage reduced the yield of oats, (2) all phenoxy compounds were toxic to legumes when applied without a canopy of oats and (3) 3,4-D is less toxic than 2,4-D and MCP. In another test 1/4 lb. of 3,4-D at 2-3 and 5-6 leaf stages controlled the weed (lettuce) and caused no injury to alfalfa seedlings nor to the oats. No other phenoxy compounds were used. The results of a tolerance study on one year old alfalfa are here listed. All materials were applied at 4, 8 and 16 oz. at three stages: (1) up to 4 inches high, (2) up to 6 inches high, and (3) up to

9 inches high. They are listed in order from safest to least safe.

Safety Rating		Stage	Degree of Injury		
			4 oz.	8 oz.	16 oz.
1	4-C amine	1	none	slight	slight
		2	slight	slight	moderate
		3	slight	slight	moderate
2	3,4-D ester	1	slight	slight	slight
		2	slight	moderate	moderate
		3	slight	moderate	moderate
3	4-C ester	1	slight	slight	moderate
		2	slight	moderate	moderate
		3	moderate	moderate	severe
	2,4-D amine	ratings not listed			
	MCP amine	ratings not listed			
4	2,4-D ester	ratings not listed			
	MCP ester	ratings not listed			

Safety was as listed and susceptibility increased slightly as the season advanced.

Results from 3,4-D in comparison with 2,4-D and MCP on flax and field peas are brought together in the following tabulation:

Crop	Treatment	Crop Increase % Dosage Rate (oz.)						Weed Reduction (%) Dosage Rate (oz.)					
		2	3	4	5	6	8	2	3	4	5	6	8
Flax (2 in.)	3,4-D ester	6		12		-11	-20	66		72		30	57
	2,4-D ester	19	77		-5			69	88		99		
	MCP amine		71		13		19		88		79		90
Field Peas 2 1/2 in.	3,4-D ester	50	11	29	22			48	48	41	83		
	2,4-D ester	47	23	8				75	65	67			
	MCP amine	35	23	55				89	61	40			
Field Peas 4 in.	3,4-D ester	-6	-13	-1				82	61	72			
	2,4-D ester	-17	-6	-13				74	77	74			
	MCP amine	1	-3	4				76	85	62			
Field Peas 9-10 in.	3,4-D ester, 2,4-D ester, MCP amine	all materials at all rates caused severe injury						all materials at all rates fair to good; best 2,4-D (4 oz.) 91%; least 3,4-D (5 oz.) 62%					

3,4-D ester at 3, 5 and 8 oz. applied to barley (6 inches high) controlled weeds except wild buckwheat and caused no injury to barley. Tolerance tests on seedling alfalfa (2 leaf stage) gave the results shown in the following tabulation:

	Stand Reduction (%) Dosage Rates/A. (oz.)						
Material	2	4	6	8	16	32	64
3,4-D ester	+2	24	17	1	4	14	15
4-C ester							
MCP ester	18	32					
2,4-D ester	6	39					

Results of another experiment on alfalfa show about equal stand reductions of seedlings (1953) for 4-C, MCP and 2,4-D but without yield reduction in 1954. 4-C and 3,4-D were less effective in a late treatment on Russian thistle in flax than 2,4-D. MCP apparently was intermediate and all treatments significantly reduced height of flax.

Rather extensive activity tests on various weeds was reported. The results are tabulated below. One item in this list is a group of 18 weeds and for them the average for each material for the 18 is used. They include species of a wide range of susceptibility such as mustard on one extreme and night flowering catchfly on the other. MCP and 2,4-D are included for comparison. For the individual weeds the average for the three rates (4, 8 and 16 oz.) is used.

	Percentage Control						
Weed	2,4-D Ester	MCP Ester	2,4-D Amine	MCP Amine	4-C Ester	3,4-D Ester	4-C Amine
18 species	82	75	70	67	66	60	56
tartary buckwheat	67	57	50	68	62	31	58
wild buckwheat	44	31	42	22	10	22	25
Russian thistle	88	64	67	32	56	70	56
night flowering catchfly	32	35	25	23	42	27	38
cow cockle	75	68	48	43	53	41	20
average of 5 species	61	51	47	37	45	38	39

Results from the five individual species do not follow any clear pattern. All treatments were low on wild buckwheat and catchfly and the averages for the five species show about the same values as those for the 18 species in the first line with 2,4-D ester first, MCP ester second, and 2,4-D amine third, with 4-C ester having a higher value than MCP amine and approaching 2,4-D amine. MCP amine, 3,4-D ester and 4-C amine were about equal. 3,4-D gave

no control or poor control of wild oats seeded in rows or in flats and emergence of stinkweed and wild mustard was prevented by the amine salts of 3,4-D, MCP and 2,4-D at 5 lbs. per acre.

Sodium Trichloropropionate (6249) (4 reports) was reported for three experiments on canning peas and one on sugar beets. Pre-emergence applications of 5, 10 and 20 lbs. caused twisting of the peas and gave poor grass control. Post-emergence treatments of 2, 4 and 6 lbs. on early and late peas did not give weed control without injury to crop. In a pre-emergence treatment on sugar beets in comparison with TCA and dalapon grass control was 96% with 4 lbs. dalapon, 92% with 5 lbs. TCA and 6249 was reported as less effective than dalapon. Post-emergence treatments on beets of the three materials gave grass controls of: 92% for 4 lbs. 6249, 92% for 2 lbs. dalapon, and 95% for 5 lbs. TCA.

Dalapon (2,2-Dichloropropionic Acid) (31 reports) used as the sodium salt was reported for various types of use. Absorption and translocation studies on quackgrass indicates equal results from treating (1) shoots, (2) soil, or (3) both. It moves in either direction in rhizomes and from one treated shoot through rhizome to other shoots. There is evidence that it moves with photosynthates and that it enters leaf within 5 minutes but requires 30 minutes to absorb enough to eventually kill untreated shoot. Dalapon at 3 lbs. pre-emergence in sugar beets gave 96% control of grasses and 5 lbs. stunted beets temporarily; 2 lbs. at four leaf stage gave 92% control of grasses and 3 lbs. at 6-7 leaf stage gave 90% control. TCA was more toxic than dalapon at 4 leaf stage but the reverse was true at later stage. Another study on sugar beets at 4-8 leaf stage involved 17 fields with dalapon at 3.4 and 6.8 lbs. and TCA at 4 and 8 lbs. Results were nearly equal for the two materials at these rates. Dalapon showed more injury in three fields. Dalapon applied to weed free beets at 4, 6 and 8 lbs. at four post-emergence stages gave indications of yield reduction.

Alfalfa seedlings showed much tolerance to both pre- and post-emergence applications. A study with seven legumes treated at the 3 inch stage with dalapon and TCA showed alfalfa and bird's foot trefoil to be tolerant to dalapon with others being susceptible. TCA had little effect on sweet clover and trefoil and not much on alfalfa. Four pounds dalapon and 9 lbs. TCA gave good control of green foxtail. Another study on seedling alfalfa with dalapon, TCA and several other materials indicated dalapon and TCA to be most promising with highest yield and best grass control when applied 4 weeks after emergence. Alfalfa seeded March 25 was teeated at 6 and 9 weeks after planting. Good to excellent control of grasses was obtained with 1 1/2 and 3 lbs. at 6 weeks and 3 lbs. at 9 weeks. Smart weed was not well controlled. Alfalfa stand was reduced by the 6 weeks treatment but at the 9 week treatment it was not reduced. Similar studies on birds foot trefoil indicate fair to excellent tolerance to dalapon with TCA being a little safer.

Combinations of (1) dalapon and DN and (2) dalapon and CMU gave significant weed control and no significant reduction in yield of muck grown tomatoes. Dalapon pre-emergence on onions did not give good control of grasses and reduced onion stand. Early post-emergence use of dalapon (2 lbs.) and CMU (1 lb.) on onions gave 88% weed control without crop reduction and a later treatment of dalapon (4 lbs.) and CMU (2 lbs.) gave highly significant control of broadleaves but not of grasses and reduced yield. Post-emergence use on early canning peas of 2, 4 and 6 lbs. did not give control without injury and on late peas there was fair to good grass control, poor broadleaf control and some injury. On flax (3-4 inches) dalapon at 4, 6 and 8 lbs. and TCA at 4, 6, 8 and 12 lbs. controlled green foxtail at all rates. TCA caused little or no reduction in flax yield but dalapon caused severe retardation and yield reduction. On weed-free flax dalapon at 1, 2, 4, 6, 8 and 12 lbs. at 2 1/2-3 inches and 13-18 inch stages retarded blossoming and maturity and caused dropping of buds and immature bolls even at the 1 lb. rate. Four pounds and more reduced yield to practically nothing.

There were several reports on wild oats control with dalapon. Wild oats (2 1/2 to 3 inches) in field peas were sprayed with 3, 6 and 9 lbs. dalapon. Oats were stunted rather than killed. Three pounds had only slight and 6 lbs. moderate effect with almost complete control at 9 lbs. The peas were delayed by 9 lbs. Pre- and post-emergence treatments of 6 and 8 lbs. of dalapon and TCA were made for wild oat control. TCA was ineffective and dalapon gave 50 and 70% (for 6 and 8 lbs.) pre-emergence and 60 and 80% post-emergence. All treatments gave good to excellent control of green foxtail. Several crops were planted across plots. Sugar beets, rape and potatoes were resistant to all treatments, peas and sunflowers were intermediate and corn and soybeans were suceptible. Post-emergence treatments were more toxic to crops than pre-emergence and dalapon more than TCA. A 1952 post-emergence treatment of 4 lbs. on wild oats had no effect on the 1954 wild oat crop. The results of another elaborate study using 4, 6, 8, 12 and 16 lbs. at four stages of growth are here tabulated. The stages were (1) 2-3 inch, (2) 4-6 inch, (3) 12-14 inch, fully tillered, and (4) 22-27 inch boot stage.

Stage	Dosage (Lbs.)				
	4	6	8	12	16
	Growth Reduction (%)				
1	52	56	74	78	85
2	95	96	98	99	98
3	equal to 2				
4	results poor				
	Heading Reduction (%)				
1	78	92	98	99	100
2	99	100	100	100	100
3	97	99	99	100	100
4	22	32	36	36	40

In combination chemical-tillage studies on quackgrass or couch grass low rates of dalapon and TCA were much more effective with tillage either before or after treatment than when used alone and TCA was about 25% less effective than dalapon. A second quackgrass study using dalapon at heading stage on mowed and unmowed grass at 10, 30 and 50 lbs. gave 100% top kill for all rates on both mowed and unmowed. The 10 and 30 lb. rates showed considerable regrowth in September. Treatments of 30, 40 and 50 lbs. on 15 inch Johnson grass killed the tops and part of the roots in one study and in another 20, 40 and 80 lbs. on first growth, regrowth and bare soil all gave stand reduction of better than 90%. In a third study on Johnson grass dalapon applied July, 1953 at 20 and 50 lbs. showed 91% control for both rates in July 1954.

Setaria was sprayed at 3 stages (1) 2-8 leaf, (2) 6-12 leaf, and (3) fully tillered with dalapon at 1, 2, and 4 lbs. and TCA at 4 and 8 lbs. Results are tabulated below:

Stage	Dalapon			TCA	
	1	2	4	4	8
1	78	96	98	89	94
2	51	78	88	11	38
3	1	24	36	0	0

Downy brome and hairy chess sprayed when 2 1/2 inches high with dalapon at 2, 4 and 6 lbs. was controlled 86%, 100% and 100%, respectively, for the three rates.

Wild buckwheat (6-7 inches high) was reduced in vigor by 10 lbs. of dalapon but 3 and 5 lbs. had little or no effect. Field horsetail was controlled to a high degree with 20 and 40 lbs. Summer fallow land was treated with dalapon at 3 and 5 lbs. alone and with 1/2 lb. 2,4-D on August 17. Each treatment was used with 4 and 8 gallons of water per acre. 2,4-D gave

excellent control of broadleaves. The 3 and 5 lb. rates in 4 gallons and the 3 lb. rate in gallons of water were not satisfactory on grasses. Five pounds dalapon in 8 gallons of water severely stunted the grass and killed some of the small plants but many were alive 3 weeks after treatment.

Amizol (3-Amino-1,2,4-Triazole) was reported for a wide variety of studies on weeds and crops. Pre-emergence application on corn of 1, 2 and 4 lbs. gave outstanding weed control at 2 and 4 lbs. Directed sprays of 1/2 and 1 lb. at 8-9 leaf stage apparently caused no injury. An overall spray at that time of 1 lb. caused temporary loss of chlorophyll. Treatments in flax (2 inches high) of 2, 4, 6, 8 and 10 oz. gave poor weed control (Russian pigweed, stinkweed and Russian thistle) and all rates were severe on flax. Pre-emergence treatment on snapbeans on muck gave poor weed control at 4 lbs. but good at 8 lbs. and without crop reduction. On canning peas a pre-emergence treatment gave significant control of broadleaves without excessive injury but a rate effective on grass caused injury. Post-emergence treatment on peas did not control weeds without injury. Field peas were sprayed post-emergence with 2, 4, 6 and 8 lbs. at three stages: (1) 2 1/2 inches high, (2) 4 inches high, and (3) 9-10 inches high. At stage 1 weed control was moderate but all rates caused reduction in vigor, delayed maturity and reduced yield. Weed control was poor to fair in stage 2 but all rates caused severe crop reduction and in stage 3 weed control was fair but peas were sensitive to 2 oz. Barley treated when 6 inches high with 2, 4, 6, 8 and 10 oz. was affected markedly by 2 oz. with stunting, delayed maturity and yield reduction. Weed control was good except for wild buckwheat. Four experiments for the control of Canada thistle were reported. In rosette and pre-bud stages 2 oz. was poor, 4 oz. gave some control and 8 oz. was better but flax was killed at all rates. Two, 4, and 8 lbs. on thistle 3 to 15 inches high caused chlorosis and eventual top kill (except 2 oz.). Most new shoots were chlorotic and died. Portion of roots were dead in October to depth of 12 inches. Mowing 7 days after spraying reduced effectiveness. A third experiment which involved combinations of chemical and cultivation gave slow but complete top kill with 3 lbs. or more and with little regrowth. One pound on oats (at heading stage) gave good results on thistle. Johnson grass treated in May with 2, 4 and 8 lbs. developed severe chlorosis but recovered in 4 weeks and grew normally for the rest of the season. Quack or couch grass treated in various ways at heading stage with 1, 2 and 3 lbs. was not controlled. A mixed stand of couch and brome grass treated with 5, 10 and 15 lbs. developed chlorosis and eventually complete top kill but apparently normal new growth developed from roots.

The results from a group of 18 weeds and several individual weeds are compiled here. The 18 weeds include species of all ranges of susceptibility to 2,4-D, which is reported as a

comparative material. The rates in all cases are 4, 8 and 16 oz.

Weed	Percentage Control With					
	Amino Triazole			2,4-D Ester		
	4 oz.	8 oz.	16 oz.	4 oz.	8 oz.	16 oz.
18 species	average of 3 rates		57	average of 3 rates		70 (amine)
tartary buckwheat	58	67	88	25	79	96
wild buckwheat	8	13	50	21	33	79
Russian thistle	4	4	63	75	92	96
night flowering catchfly	13	13	63	29	42	54
cow cockle	13	17	58	63	75	88

Wild buckwheat in another test sprayed at 6-7 inch stage with 3.5 and 10 lbs. was well controlled with 5 and 10 lbs. and in still another 4, 8 and 16 oz. on wild buckwheat in wheat reduced the yield of wheat without killing the buckwheat. Hoary cress treated with 3, 6 and 16 lbs. alone and in combination with mowing gave slow but complete top kill with little difference between 3 and 16 lbs. Best results was at bloom stage when treated, cultivated and retreated. A similar set of treatments on leafy spurge gave slow but complete top kill and considerable regrowth. One and 2 lbs. on toad flax gave good top kill but with some regrowth. Horsetail in grass treated at 3 and 6 inch stages with 5 and 10 lbs. was fairly well killed with 5 lbs. at the 6 inch stage and there was good kill with 10 lbs. at same stage. The 3 inch stage was apparently too early.

Amizol was reported for three studies on desiccation of switch grass, grain sorghum and corn. On switch grass small amounts added to other materials gave marked increase in activity of Magron, Chem-Frost and sodium monochloroacetate but not with Endothal. Similar results were obtained with grain sorghum and hybrid corn.

Crop tolerance studies on soil treated for quackgrass control with 4, 8, 12, 20 and 40 lbs. included field corn, soybeans and tomatoes (transplants) planted 3, 7, 11, 14, 21, 28 and 49 days after treatment. There was little or no effect on any of the crops from 4, 8, 12 and 20 lbs. when planted 11 days or more after treatment but all plants showed chlorosis from the 40 lbs. even at 49 days.

Mechanical Considerations

R. E. Larson

Summary

The several abstracts submitted for inclusion in this section deal with equipment for mechanical and chemical brush control and for weed control in field crops.

Brush control equipment: Roth and Porterfield report a study of the use of a portable wood chipper for disposing of brushy growth and find that the productive capacity of the chipper is dependent upon the preparatory labor which includes cutting, trimming, and piling, and on the ratio of brushy growth to trimmed poles. Roth and Porterfield also report the use of a heavy duty stalk shredder as a selective brush control method and find that such a shredder with modifications would probably require a live P.T.O. The shredder is effective for eliminating brushy growth and for removing the tops and branches of small trees, leaving the stumps split and fractured.

Larson and Crumpacker report a study of chemical brush control methods and equipment and show the relative cost and effectiveness of six brush control treatments including basal knapsack, basal handgun, foliage handgun, foliage boomless nozzle, notch and concentrated herbicide, and a clearing and stump treatment. They indicate a basal knapsack treatment to be the best in that it is low cost and produces the best results. They find, in comparing basal handgun treatments with basal knapsack treatments, that the handgun applies approximately 2.2 times as much material as is applied by knapsack. They also find that the boomless nozzle can give good brush control but presents a problem in obtaining good coverage.

Weed control equipment: Nash, Wallace, and Derscheid report a study of aerial application versus ground application of 2,4-D for control of weeds in wheat. Variables included five ester formulations of 2,4-D, five rates of application of 2,4-D, oil and water carriers and five volumes. At one location the study of rates indicated that 3/4 lb. 2,4-D acid equiv./A reduced yield. All other treatments showed no significant yield differences from the untreated weedy checks.

Liljedahl and Strait report studies of three commercial designs of broadcast nozzles and find that this type nozzle should be used with as little wind as possible and that best coverage and results will apparently be obtained if the swaths are overlapped about half way. Strait and Liljedahl also report that in studies on weed control in corn they find that DNOSBP with two shovel cultivations gave good results. The effectiveness of other treatments including spike tooth harrow and rotary hoe in combination with shovel cultivation were reduced due to the quack grass present. Lovely reports that 2,4-D and DNOSBP applied pre-emergence gave effective weed control and replaced one early shovel cultivation operation. As lay-by sprays, these herbicides were not satisfactory. In another study he found that the use of sized granular 2,4-D dust gave promising weed control if the application is followed by rain. His studies also indicate that the use of such dust will require special application equipment.

The portable wood chipper used as a means of brush disposal for land clearing purposes. Roth, L. O. and Porterfield, J. G. A portable cylinder type wood chipper mounted on the front of a Farmall Super "M" tractor was used to chip the brushy growth and tree stems under 4 in. in diameter on 12 0.1 A plots covered with post oak and blackjack oak species. The type of growth on the plots ranged from nearly all small brushy growth to dense stands of tall slender trees with little side branching. The plots were sawed with a portable circular saw, trimmed and piled by hand and chipped. Principal results of this study are shown in Table I.

Table I

Plot	Chip Yield Ton/A	Prep. Labor (Saw, Trim, Pile) Man-Hrs/A	Chipping Labor Man-Hrs/A	Chip Prod. Rate Tons/Hr	Total Cost $/Ton Chips	Total Cost $/Acre
A*	1.76	3.65	6.16	0.573	9.58	16.80
B**	10.52	45.00	18.13	1.162	8.17	85.30

*A - Average of plots covered with mostly brushy growth.
**B - Average of plots covered with tall, slender trees.

Conclusions drawn from this study are: (1) Careful trimming, piling and orientation of the wood to the chipper made feeding easier and resulted in increased feeding efficiency, (2) the productive capacity of the chipper was substantially reduced when the proportion of brush trimmings to trimmed poles processed was increased, (3) using sharp knives with the proper cutting bevel angle was one of the most important factors in maintaining a high chip production rate, (4) chip yield from brushy plots was low and the chips could only be utilized as mulches; chips produced from trimmed poles would make good bedding or mulch, could be produced in large quantities quickly and could possibly be processed further into other products, (5) after all growth under 4 in. diameter is removed, the areas are cleared enough to allow fertilizing and seeding machinery to cover the area; subsequent operations must follow chipping to check the resprouting growth, (6) because of the amount of labor required, this method of clearing is too expensive for the returns that might be expected unless chip utilization as bedding, mulches, or other uses would offset part of the cost of the operation. (Agricultural Engineering Department, Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma).

A heavy duty stalk shredder used as a mechanical means of selective brush removal. Roth, L. O. and Porterfield, J. G. Stem counts on a number of typical areas covered with blackjack oak and post oak brush and trees showed a large proportion of tree stems of such size as could be mechanically removed by a heavy duty stalk shredder. The large trees and stems too large for the shredder to dispose of were observed to generally be scattered to allow equipment movement among them. An integral mounted PTO powered shredder was used because of maneuverability features. The shredder had free-swinging, horizontal rotating blades. A blade carrier supported four 12 in. blades with two blades on each end spaced 6 in. apart vertically. With the tractor used at full throttle the forward advance of the shredder per knife was 2.5 in. and in reverse 2.6 in. advance of shredder per knife. At operating speed the cutting blade top speed was 10,300 fpm. Changes made on the shredder to adapt it to this work were to: (a) Cut away the skirt shield at the rear of the shredder, (b) provide a rear bumper to aid in cutting the growth when backing, (c) replace the original eccentric blade mounting with an incline yoke arrangement and (d) provide suitable shielding for the tractor and operator. Results and conclusions from 0.1 A plot studies are: (1) An average of 6 shredder-hours per A was required to dispose of the shreddable

growth. (2) About 50% of the operating time was unproductive (idle travel, etc.) and could be reduced by operating in larger areas and by the use of a tractor equipped with a live PTO shaft. (3) For maximum shredder effectiveness the tractor should have a live PTO shaft to provide variation in the advance per cut ratio and to keep the blades turning at a good shredding speed. (4) To saw the growth, then shred the tree tops and brush did not prove satisfactory because of the extra labor involved in sawing and the difficulty in driving the tractor over fallen trees. (5) The action produced by the shredder will completely fragment brushy material, will remove and fragment the tops and side limbs from small trees and will leave the tree stumps split and fractured. (6) Subsequent shredding of the areas must follow periodically to check the resprouting growth. (7) The cost of removing the growth ranged from $10 to $20 per A depending largely upon the arrangement of the growth. (Agricultural Engineering Department, Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma).

A study of methods and equipment for chemical brush control. Larson, R. E., Crumpacker, J. D. A study was initiated in 1954 to determine the relative cost, effectiveness, and ease of application of various chemical brush control methods. Replicated plots 3/4 A in size, containing predominantly second growth Hickory (Carya spp.) which av. 2" in basal dia. (range 1/2" to 6"), 15' in height (range 10' to 25'), and 1750 stems/A (range 1300 to 2300 stems) were located in an old pasture. Four treatments, Basal Knapsack (BK), Basal Handgun (BH), Notch Oilcan (NOC) (conc. chem. applied by oilcan to ax cuts) and Clearing & Stump (C&S) were applied in Feb. Two treatments, Foliage Handgun (FH), and Foliage Boomless Nozzle (FBn) (a boomless nozzle atop a 22' tower mounted on the rear of a row-crop tractor) were applied in June. All treatments were planned for application by a one-man crew.

Results on acre basis

Treatment	Chem.[1]	#Chem	Gal Oil	Man hours	Mach cost	Total cost[2]	Stem/ acre	% defol[3]
BK	16# ahg oil	4.01	24.17	3.99	0.20	19.36	1540	97
BH	10# ahg oil	5.73	55.76	2.19	2.52	29.57	1692	95
NOC	4#/gal (undil.)	6.26	---	6.32	---	24.36	1988	63
C&S	16# ahg oil	1.61	9.69	33.38	3.61	43.08	1549	88*
FH	3# ahg water	6.18	---	2.79	3.20	23.79	1846	89
FBn	10# ahg 10% emul.	3.56	2.68	0.51	0.60	11.76	1788	56

[1] 2,4,5-T Propylene Glycol Butyl Ether Esters.
[2] Total cost based on Chemical @ $2.88/lb, Labor @ $1.00/hr, Oil @ $0.15/gal.
[3] September 1954. * Based on stumps not resprouting.

It was difficult to obtain uniform coverage with the FH and the FBn treatments. The NOC treatment was very disagreeable to apply esp. with wintertime ground conditions. In the C&S treatment app. 5% of the stumps could not be found and sprayed due to excessive leaf cover. Basal treatment with the handgun was much easier than with the knapsack. (Contributed by Farm Machinery Section, A.R.S., U.S.D.A., and Agricultural Engineering Department, Missouri Experiment Station, Columbia, Missouri.)

Basal Handgun Treatment for Brush Control. Larson, R. E., Crumpacker, J. D. A study was initiated to determine the rates to be used for basal handgun treatments. The applications were made with a tractor mounted sprayer equipped with power take-off pump, 50' of hose and a trigger type handgun. All stems 1/2 inch and larger were treated. The brush was approx. 95% Hickory (Carya spp.) plus an occasional oak or red cedar. 2,4,5-T Propylene Glycol Butyl Ether ester was applied at the following rates: A. 5# ahg oil,

B. 10# ahg oil and C. 5# ahg 25% oil-water emulsion plus 1% wetting agent. The results based on defoliation were A. 97.1%, B. 98.2%, and C. 61.3%. The studies indicated that the basal handgun with a #6 tip operated at 30 psi applied an average of 35.7 gallons of spray per 1000 stems or 2.2 times as much as was applied by comparable basal knapsack treatments. (Contributed by Farm Machinery Section, A.R.S., U.S.D.A., and Agricultural Engineering Department, Missouri Experiment Station, Columbia, Missouri.)

The use of the boomless nozzle for brush control. Crumpacker, J. D., Larson, R. E. In a study set up to observe the use of the boomless nozzle for brush control, a double nozzle of this type was mounted atop a 22' tower which in turn was mounted on a crawler type tractor. The total height of the nozzle was 27'. The brush was primarily elm plus minor species including dogwood, sycamore, plum, and others. The individual trees ranged to 28' in height with the bulk being 4'-16'. The spray swath was 40', pressure 40 psi and volumes were 30 and 60 gal per acre. The herbicide used in this study was a 50-50 mixture of 2,4-D and 2,4,5-T Propylene Glycol Butyl Ether Esters applied at 2, 3 and 4 lbs per acre. The track type tractor was able to maintain proper swath width much more easily than a row-crop tractor in similar growth. Where the swath width was maintained, the results indicated a fairly uniform defoliation of 92.6%. There was little evidence of any differences due to the chemical rate per acre or to the volume applied per acre. Where the swath width tended to increase over 40', the defoliation decreased rapidly. Occasional misses were noted part of which were attributed to the exaggerated movement of the top of the tower in response to the small rocking action of the tractor. This would indicate that the tower should be separated from the tractor movement by a system of counterbalances. (Contributed by Agricultural Engineering Department, Missouri Experiment Station, and Farm Machinery Section, A.R.S., U.S.D.A., Columbia, Missouri.)

Comparison of 2,4-D esters on spring wheat and annual weeds when applied by ground and air. Nash, Russel L., Wallace, Keith E., and Derscheid, Lyle A. Sextuplicate plots (50' x 60' for air and 20' x 60' for ground) were treated with five formulations of 2,4-D at 1/3# acid equiv./A at Strool (in northwestern S.D.) June 3 and 4 and at Huron (in central S.D.) June 9. Wheat was in the 5-leaf stage and moderately infested with annual weeds. Two different carriers were used, 1 gal/A for air and 10 gal/A for ground. A butyl ester was applied in 1 gal oil, 1 gal H_2O, and 10 gal H_2O per acre; a conc. (oil miscible) butyl ester in 1 gal oil and an isopropyl-butyl ester in 1 gal H_2O and 10 gal H_2O per acre were applied. Yield data were calculated in bu/A and analyzed statistically. Weed counts were also taken at time of harvest. It was not established that any treatment caused the yield to be different from that of the untreated weedy check. (Contributed by the Agronomy Department, South Dakota State College, Brookings, South Dakota).

Effect of different rates of application of 2,4-D on yield of spring wheat and weed infestation when applied by air and ground. Nash, Russel L., Wallace, Keith E., and Derscheid, Lyle A. Sextuplicate plots (50' x 60' for air and 20' x 60' for ground) were treated with a butyl ester of 2,4-D at 1/8, 1/4, 1/3, 1/2, and 3/4# acid equivalent per acre at Strool, (northwestern S.D.) on June 3 and 4 and Huron (central S.D.) on June 9 using 1 gal oil/A for air and 10 gal H_2O/A for ground as carriers. Wheat was in the 5-leaf stage at time of treating and was moderately infested with weeds. Yield data were calculated in bu/A and analyzed statistically. Weed counts were also taken at harvest time. Wheat yields at Strool were significantly lower on plots treated with 3/4# 2,4-D acid equiv./A, while wheat yields were significantly higher on plots treated

with 1/3, 1/4, and 1/8 lb/A, indicating that rates of 1/2 lb 2,4-D acid equiv./A or less gives no reduction in yield. At Huron no significant differences were noted. (Contributed by Agronomy Department, South Dakota State College, Brookings, South Dakota).

Effect of different carriers on spring wheat when applied by air with and without 2,4-D. Nash, Russel L., Wallace, Keith E., and Derscheid, Lyle A. Sextuplicate plots (50' x 60') were treated with three different carriers, heater oil (No. 1 Diesel fuel), water, and furnace oil (No. 2 Diesel fuel), with 2,4-D (butyl ester), 1/3# acid equiv./A and with no 2,4-D added. The treatments were applied at Strool (northwestern S.D.) June 3 and at Huron (central S.D.) on June 9 when the wheat was in the five-leaf stage and moderately infested with weeds. Yield data were calculated in bu/A and analyzed statistically from 5 sq yd samples cut from each plot. Weed counts were also taken at harvest time. It was not established that any treatment caused the yield to be different from that of the untreated weedy check. (Contributed by Agronomy Department, South Dakota State College, Brookings, S.D.).

Effect of ground and air application with five volumes of carrier on spring wheat infested with annual weeds. Nash, Russel L., Wallace, Keith E., Derscheid, Lyle A. Sextuplicate plots (50' x 60' for air and 20' x 60' for ground) were treated with a butyl ester of 2,4-D at 1/3# acid equivalent/A at two locations (Strool and Huron, South Dakota) using water and oil as carriers. Volumes of 1/2, 1 and 2 gal/A of oil and water were applied by air and volumes of 2, 5 and 10 gal/A were applied by ground with the exception of 10 gal/A of oil. Split plot design was used, with volumes as main plots and treatments as sub plots. Applications were made June 3 and 4 at Strool (in northwestern S.D.) and June 9 at Huron (in central S.D.). Wheat was in the 5-leaf stage at the time of application and moderately infested with annual weeds. Weed readings were taken at time of harvest; wild buckwheat and sunflowers were present but stunted considerably as compared to the unsprayed weedy check. Five square yard samples were cut from each plot. Field data were calculated in bu/A and analyzed statistically. It was not established that any treatment caused the yield to be different from that of the untreated weedy check nor were any differences noted among volumes or between oil and water as carriers. These data are similar to those obtained from a similar experiment in 1953. Spray retention data were collected by application of dye with the treatment and washing samples cut following treatment. These data are not completely analyzed and will not be presented at this time. (Contributed by Agronomy Department, South Dakota State College, Brookings, South Dakota).

Field tests of broadcast sprayer nozzles. Liljedahl, L. A., and Strait, John. Three different commercial designs of broadcast nozzles available in the spring of 1954 were used to apply a pre-emergence spray of TCA to soybeans. Applications were made with sprayer travel both perpendicular and parallel to the wind, and at pressures of 15, 30, and 60 psi. Wind during these tests was in the range of 4-7 mph. Field spray patterns were then obtained by comparing damage of soybeans due to root absorption of the TCA at intervals across the swath with damage in plots which had received known dosages.

It was found that reasonably uniform distribution (with coefficient of variation less than 20%) could be obtained with the following swath widths:

	parallel to wind			perpendicular to wind		
	15 psi	30 psi	60 psi	15 psi	30 psi	60 psi
nozzle #3	34 ft.	36 ft.	*	**	20 ft.	**
nozzle #4	*	*	*	20 ft.	**	**
nozzle #5	**	36 ft.	*	**	15 ft.	**

* Coefficient of variation greater than 20% all swath widths.
** Tests under these conditions were not run.
(Contributed by Farm Machinery Section, Agricultural Research Service, U.S.D.A., and the Department of Agricultural Engineering, University of Minnesota Agricultural Experiment Station, St. Paul, Minnesota.) (Paper No. 3261, Scientific Journal Series, Minn. Agr. Expr. Sta.)

Laboratory tests of broadcast sprayer nozzles. Liljedahl, L. A., and Strait, John. Three different commercial designs of broadcast nozzles available in the spring of 1954 were tested in the laboratory on an apparatus capable of sharply dividing the spray pattern. Distribution patterns were obtained at 10, 15, 20, 30, 40, and 60 psi pressure with nozzles at manufacturer's recommended settings. The coefficient of variation of the patterns obtained when used with a 40 ft. swath were as follows:

	10 psi	15 psi	20 psi	30 psi	40 psi	60 psi
nozzle #3	46.0	38.8	28.8	15.0	16.4	25.4
nozzle #4	47.8	38.7	24.2	16.2	24.8	66.0
nozzle #5	57.0	36.0	31.8	34.5	26.4	35.7

(Contributed by Farm Machinery Section, Agricultural Research Service, U.S.D.A., and Department of Agricultural Engineering, University of Minnesota Agricultural Experiment Station, St. Paul, Minnesota.) (Paper No. 3263, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Comparison of some mechanical and chemical weed control methods on corn. Strait, John, and Liljedahl, L. A. On ground which was rather badly infested with quack grass, six plots of corn, replicated three times, were given various treatments. Notes were taken during the season on control of grassy weeds; broadleaf weeds were counted in early fall. Results were as follows:

Treatment	Broadleaf Weeds/A
1. Check - 3 shovel cultivations	11,946
2. 4½ #/A DNBP at 2-4" height plus 2 shovel cultivations	2,563*
3. 1½ #/A butyl ester of 2,4-D four days after planting plus 2 shovel cultivations	10,619
4. Spike-tooth harrow at 2-4" height, rotary hoe at 6-8" height, plus 2 shovel cultivations	25,677
5. Rotary hoe at 2-4" height, plus 2 shovel cultivations	56,498**
6. Rotary hoe at 2-4" height, rotary hoe at 6-8" height, plus 2 shovel cultivations	42,100**

* Significantly better control than check, 1% level.
** Significantly poorer control than check, 1% level.
Grass control appeared to be proportional to that of broadleaves. No treatment gave satisfactory control of grassy weeds, although #2 was considerably better than others. Yield data were not available in time for this abstract. (Contributed by Farm Machinery Section, Agricultural Research Service, U.S.D.A., and Department of Agricultural Engineering, University of Minnesota Agricultural Experiment Station, St. Paul, Minnesota.) (Paper No. 3262, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Pre-emergence 2,4-D applications and post emergence DNOSBP applications as substitutes for mechanical cultivations in field corn. Lovely, W. G. Corn was hill-dropped on May 7, 1954 in 42 in. rows in 6 row plots. Overall and strip applications of 2,4-D low volatile ester were applied at the rate of 1½ lb/acre in 10 gal H_2O on May 7. Overall and strip applications of DNOSBP were applied at the rate of 3 lbs/acre in 20 gals H_2O on June 6 when corn was 3 to 5 in. high. Using a high-clearance sprayer and special drop pipes to direct the spray at the base of the corn plant the same rates of 2,4-D and DNOSBP were applied on July 17. All pre-emergence and early post emergence sprays were applied to two plots in each replication. One of these received two mechanical cultivations, the first being done when the corn was 12 to 15 in. high. The other received only the lay-by cultivation. The weed weight and yield data are not available at this time. However, notes and observations on these plots indicate the following: 1. Pre-emergence applications of 2,4-D at the 1½ lb/acre rate in 10½ inch strips directly over the row or over the entire area gave excellent early control of weeds. The first mechanical cultivation was done when the corn was 12-15 inches high. Thereby eliminating the time consuming and difficult task of cultivating 4 to 6 inch corn. 2. The pre-emergence 2,4-D applied in strips or over the entire area was not effective enough to obtain satisfactory weed control with one mechanical cultivation at lay-by time. 3. Strip and overall applications of DNOSBP made when the weeds started to emerge and when the corn was 3-5 inches high were effective in retarding weed growth, but the corn plants were injured. Both annual grass weeds and corn recovered. Two mechanical cultivations performed after the corn was 12-15 inches high resulted in good weed control. However, it was noted that on the wet areas of the field the weeds recovered rapidly and were a problem. 4. Where only the lay-by cultivation was performed in addition to strip or overall applications of DNOSBP at the 3-5 in. height very poor weed control was obtained. 5. As lay-by sprays, neither the 2,4-D nor the DNOSBP were successful. The 2,4-D controlled the late developing susceptible broad-leaf weeds, had very little effect on grasses, and did not injure the corn. The DNOSBP caused some burning on the lower corn leaves. Other than showing some leaf burning shortly after application this spray had very little if any effect on either broadleaf or grass weeds. (Contribution of Farm Mach. Section, AERB, ARS, US Dept. of Agri. and Dept. of Agr. Engr., Iowa Agr. Exp. Station).

Applying 2,4-D granular dust for weed control in corn. Lovely, W. G. Investigations on the use of sized granular 2,4-D dust and equipment for applying it were initiated in 1954. Attaclay dust sized over 30-60 mesh screens was used as a carrier for 2,4-D low volatile ester. (6½ lbs of dust contained 1 lb acid equivalent). Initial attempts to apply this dust indicated that conventional power dusters were inadequate. Excessive packing and mechanical breakdown of the feed mechanism and the agitator occurred. A grass seeder with a false hopper-bottom, off-set metering holes, and a double-chain feed produced a fairly uniform flow of material and was used in this work. Dust was applied at the rate of 1 lb and 2 lbs per acre on field corn that was planted on May 7. In this observational type experiment the dust was applied 4 days after planting. Rainfall was practically nil for ten days following the application. When the corn was 4 to 6 inches high mechanical cultivations were necessary to control the weeds. A formal randomized-block experiment was set up to compare this dust with similar rates of low-volatile ester spray on sweet corn planted June 8. Sprays and dusts were applied at the 1 lb and 2 lb rate 4 days after planting. An occasional corn plant was starting to emerge. Early weed control for both rates of dust and spray was excellent. However, some damage occurred on plots where the spray was applied at the 2 lb/acre rate. Check plots received two mechanical cultivations and the treated plots received one when the corn was

24 inches high. Observations made throughout the season show that the annual grasses (the predominant weeds) started to recover 5 to 6 weeks after application. Weed weights taken August 30 show the 2 lb/acre dust application gave better control than the other treatments. No corn yield data were taken. Granular 2,4-D dust shows some promise; however, these experiments indicate the need for rainfall following application. If it proves effective, improvements in application equipment will be necessary. (Contribution of Farm Mach. Section, AERB, ARS, US Dept. of Agr. and Dept. of Agr. Engr., Iowa Agr. Exp. Station).

BASIC STUDIES

Summary

W. E. Loomis

The number of abstracts submitted indicates a marked increase of interest in and appreciation of basic work with herbicides. Studies of mitochondrial enzyme systems are not likely to affect the recommendations for field application of herbicide, but we hope they will help in understanding toxicity and in differentiating the action of various compounds. A successful mathematical interpretation of herbicidal action could be of immediate value in studies of rate and of synergism.

Translocation of herbicides needs more study, both from the practical standpoint of killing deep rooted plants and the basic one of understanding this important process. We feel that at least three steps are involved: penetration, which has been shown to be dependent upon surface action and temperature; loading from the leaf mesophyll into the sieve tubes, which may be affected by carbohydrate level in such a manner that the carbohydrate can be replaced by kerosene; and translocation along the phloem itself.

Studies of the persistence of herbicides in the soil are important from the standpoints of either maintaining or avoiding sterility. The chlorinated benzene ring appears to be especially resistant to bacterial action. In contrast, chlorinated alaphatics are attacked rather readily under favorable conditions of soil moisture, temperature, and aeration.

Seed production, dormancy and reaction with herbicides are important in control of both annual and perennial plants. In general, an annual plant whose seed do not show well developed primary or secondary dormancy hardly needs to be classed as a weed. Seed dormancy can enormously complicate the problem of controlling perennials also.

A better understanding of the role of competition, both as a means of controlling perennial weeds and of estimating damage of weeds to crops, is clearly needed. The Saskatoon results show the amount of competition within old stands of perennial weeds, and emphasize the relative vigor of scattered, new colonies. Work in Iowa indicates an unexpected amount of competition by corn-field weeds for nutrients and much less competition for water on our deep soils than was anticipated.

Abstracts

Effects of herbicides on mitochondrial enzyme systems. Switzer, Clayton M. The effect of various herbicides on oxidation of pyruvate and succinate by mitochondria isolated from etiolated soybeans is being studied in an attempt to pinpoint the toxic action of these chemicals. At concentrations above 2×10^{-3}M, 2,4-D strongly inhibited pyruvate respiration, whereas 10^{-3}M had little effect, 10^{-4}M increased respiration slightly, and lower concentrations had no effect. Succinate respiration was inhibited 25-50% by 10^{-3}M 2,4-D and unaffected by 10^{-4}M or lower concentrations. A 1000 ppm 2,4-D solution is 4.3×10^{-3}M.

Both succinate and pyruvate respiration were inhibited 50% or more by concentrations higher than 4×10^{-2}M (0.81%) TCA and unaffected by concentrations below 10^{-2}M. Dalapon inhibited pyruvate respiration at concentrations higher than 10^{-4}M but had little effect on succinate respiration. $NaClO_3$ at concentrations above 5×10^{-2}M (0.88%) inhibited pyruvate respiration 15 - 30% whereas concentrations of 10^{-3}M to 10^{-6}M increased O_2 uptake. Succinate respiration was 20% inhibited by 10^{-1}M $NaClO_3$ and unaffected by lower concentrations. A herbicidal oil emulsion (0.05 ml. per flask) inhibited pyruvate respiration by 50%. Greater inhibition was brought about by a similar quantity of wetting agent used alone. IAA at concentrations above 10^{-3}M inhibited succinate respiration up to 25%. Lower concentrations had no effect.

Certain herbicides (Dalapon, 2,4-D) appear to be more effective at high concentrations in inhibiting respiration of isolated mitochondria than are others ($NaClO_3$, TCA). Concentrations of 2,4-D and IAA that have been shown to increase respiration of intact tissues, such as Avena coleoptiles and pea stems, have little effect on mitochondrial respiration. The implications of these finds on herbicidal activity are being studied. (Dept. Botany, Iowa Agric. Exp. Station, Ames.)

On the kinetics of inhibition of growth by herbicides. Frans, R. E. and Lind, E. F. It is proposed that the kinetics of the inhibition of plant growth by certain herbicides can be expressed in analogy with the Lineweaver and Burk treatment of the kinetics of enzymatically catalyzed reactions and the treatment by McRae et al of the kinetics of stimulatory auxin action. Thus if

$$H + M \rightleftharpoons HM \rightarrow \text{Inhibition of growth} \qquad (1)$$

where H is a herbicide, M is a mechanism or compound to which the herbicide attaches reversibly, and reaction 3 is an irreversible reaction ultimately resulting in the inhibition of plant growth. The equation relating the rate of inhibition of growth to the concentration of the herbicide used, can be expressed as follows:

$$\frac{1}{v} = \frac{K_m}{V_{max}} \cdot \frac{1}{[H]} + \frac{1}{V_{max}} \qquad (2)$$

where K_m is the Michaelis-Menton equilibrium constant for reaction 1 and 2, and V_{max} is the maximum velocity of inhibition occurring when all of the herbicide (H) has combined to form HM. The rate of inhibition is designated by v, and the concentration of herbicide by $[H]$.

The above hypothesis has been tested by growing soybean plants in the greenhouse and treating them with varying concentrations of herbicides at the time when the primary leaves were fully expanded, but while the first trifoliate leaf was still rolled in the bud. Growth was measured as fresh weight of all plant material above the primary leaves at 10 to 14 days after treatment. A plot of the reciprocal of the rate of inhibition ($1/v$) against the reciprocal of the herbicide concentration ($1/[H]$) results in a straight line, of which K_m/V_{max} is the slope and $1/V_{max}$ is the intercept on the $1/v$ axis. A reciprocal plot of rate of inhibition vs. 2,4-D concentrations (range 10^{-5} - 10^{-3} M) gave a straight line. There are indications that this treatment may be extended to such compounds as TCA and Dalapon.

Further indications are that this interpretation may be extended to mixtures of herbicidal compounds, where the reciprocal of rate of inhibition of growth would be plotted against the reciprocal of the combined concentrations of two herbicides, the ratio between the two concentrations being constant. If the hypothesis is verified, a prediction of the efficiency of mixtures of herbicides would be possible, based on a knowledge of the constants of the individual compounds. (Dept. Botany, Iowa Agric. Exp. Station, Ames.)

The absorption and translocation of Dalapon. Santelmann, P. W. and Willard, C. J. Greenhouse experiments were carried out with quackgrass to study the absorption and translocation of Dalapon. Rhizome sections were planted in clay pots and treated when the shoots were 3 to 6 cm. tall, 6-12 cm. tall, 12-18 cm. tall, or over 18 cm. tall. Plants were immersed in Dalapon solutions for treatment in most instances. Plants were killed equally well when only the soil was treated (by spraying), the shoot was treated, or both were treated together. Solutions of 10 and 100 ppm caused no injury, 1000 ppm caused severe foliage injury within 60 days, and 5,000 to 100,000 ppm caused foliage death within 60 days. However, there were usually some new shoots after 60 days had passed. The four different height groups reacted similarly. To test translocation, in pots with 2 or more shoots from one rhizome piece, one shoot was treated by immersion and translocation was assumed to have occurred if the untreated shoot was injured. Dalapon was found to translocate very readily in either direction along the rhizome. The best translocation occured when plants 12 to 18 cm tall were treated with a concentration of at least 50,000 ppm.

In an effort to determine whether Dalapon is translocated with the products of photosynthesis, plants were placed in the dark for 48 hours, treated in the dark and 24 hours after treatment washed and put into the light. This greatly decreased the translocation of Dalapon, but did not entirely stop it. Some plants were treated by the jar method after 48 hours of darkness, and a Dalapon plus 10% sucrose solution was used. The addition of sucrose to the solution did not increase translocation. By washing or cutting the treated shoot at various intervals after treatment it was found that Dalapon entered the leaf within 5 minutes after treatment. Within 30 minutes enough Dalapon had entered the shoot to eventually translocate out and kill the untreated shoot. However, it takes at least 3 hours for Dalapon to move out of the treated leaf and into the rhizome or the untreated shoot. (Contribution of the Ohio Agric. Exp. Station)

Translocation of 2,4-D. Barrier, George E. and Loomis, W. E. Studies of translocation of 2,4-D in soybean indicate that movement is temperature dependent. Single leaves on seedling plants were treated with 2,4-D and then washed thoroughly after a 1 hr. exposure to allow penetration into the leaves but not translocation from them. The plants were then held at 5, 15 or 25°C for 4 or 16 hrs., the treated leaves removed, and translocation measured as reduced growth of the plumule after 10 days. Growth of treated plants held at 5°C. was not reduced below the controls. Significant translocation was obtained in 16 hrs. at 15° and in 4 hrs. at 25°C. (Dept. Botany, Iowa Agr. Exp. Station, Ames.)

The residual effect of CMU on some cereal crops. Carder, A. C. In mid-May seed-beds were prepared (1) where a 40-lb/A rate of CMU had been applied 3 years previously on couch turf and where nothing but a few dandelions had grown since and (2) on areas treated with 10, 20, 40 and 80 lb/A of CMU 2 years previously, and where almost complete to complete kills of couch had been obtained. On each of the five areas plots of Olli barley, Beaver oats, Redwing flax and Saunders wheat were seeded. Ten days after seeding all cereals had emerged and appeared normal and vigorous. Two weeks after seeding, when the grass cereals were up 2 in. and the flax 1 in., severe leaf necrosis appeared on the barley, slight on the oats but none on the wheat and flax. Three weeks from seeding leaf necrosis was present in all species of cereals except flax where 40 lb/A had been applied 3 years previously and 10 and 20 lb/A had been applied 2 years previously. A month from seeding no worthwhile crop remained except in the case of flax in the above 3 instances, and even here where the 20 lb/A had been applied 2 years previously there was slight thinning of the stand. The situation remained unchanged till harvest. A peculiar effect of CMU seems to be that it either kills the plant outright at an early growth stage or the plant survives and develops normally. (Contribution Experimental Station Beaverlodge, Alberta.)

Persistence of CIPC in soil. Smith, Roy J. and Slife, F. W. The persistence of CIPC in a Benton silt-loam soil was studied. Eight oz food cartons were filled with the soil. CIPC equivalent to 8 lb/A was applied to the surface soil in each of the cartons; an ample number of controls was included. At intervals of 2 weeks, 3 cartons of treated and 3 cartons of control were placed in temperature-controlled chambers at temperatures of 43, 57, 71, 85, and 99°F. The soil was kept at an optimum mositure level by subsurface watering, and the experiment terminated at the end of 10 weeks. The length of cucumber primary roots was used as a bio-assay for determining the presence of the CIPC in the soil.

Results: At temperatures of 43, 57, and 71° F, there was very little decrease in the activity of the CIPC as time progressed from 2 to 10 weeks. However, with the 85° and 99°F. temperatures, there was considerable decrease in the activity of the herbicide. At the two higher temperatures, most of the herbicidal activity had disappeared from the soil by the end of 4 weeks. However, at the lower 3 temperatures there was considerable herbicidal activity at the end of 10 weeks. (Contribution Ill. Agr. Exp. Station, Dept. of Agronomy.)

The effect of pH of the soil on the retention of 2,4-D. Robinson, Edward L., Pratt, P. F., and Willard, C. J. Samples of a Miami silt loam, original pH 5.4, were brought to 6.0, 6.8, and 7.6 pH respectively by addition of $CaCO_3$. The alkanol amine salt and the polypropylene glycol butyl ether ester of 2,4-D were applied to the surface of these samples, including also the original soil, at a rate equivalent to 3 pounds per acre, acid equivalent. The samples, 4 inches deep, were leached with 3 inches of distilled water. Approximately 30% of the 2,4-D applied as an amine salt was retained by the samples, with no differences at different pH levels. However 63.4%, 56.%, 29.0%, and 26.7% of the ester applied was retained by soil of 5.4, 6.0, 6.8, and 7.6 pH, respectively. Preliminary experiments were conducted involving the use of four times the amount of oil used in the commercial ester formulation, and also with four times the amount of emulsifier used in the commercial formulation. The addition emulsifier had little effect on retention of the 2,4-D, but the additional oil increased the retention of the 2,4-D in the ester to 72% at pH 7. There is no clear explanation for these differences: further work is in progress. (Contribution of Ohio Agric. Exp. Station.)

Factors affecting the breakdown of sodium 2,2'-dichloropropionate in soil. Holstun, J. T., Jr. and Loomis, W. E. Sodium 2,2'-dichloropropionate was applied to soil, immediately prior to storage in quart jars, at the rate of 120 ppm., with organic matter, moisture and temperature of the soil being varied. After various intervals of time the herbicide remaining in the soil was estimated by a bio-assay in which the responses of germinating millet seedlings to the herbicide in the unknown samples were compared quantitatively with the responses to known amounts. The basic soil used was Tama silt loam with a pH of 6.5. Organic matter was increase by the addition of approximately 8% combustible matter from either peat or manure. Moisture was regulated by mixing the appropriate water-dilution of the herbicide with air-dry soil just prior to storage.

The addition of organic matter to the soil immediately before adding the herbicide temporarily inhibited the rate of breakdown as compared with the rate in the natural soil. Variations in the moisture content above the field percentage did not affect the rate, but marked inhibition was obtained when the moisture of the soil was only one-half of the field percentage (wilting percentage). Breakdown appeared to be stopped, by storage at 0.5°C. and reduced by temperatures up to 20°C. as compared with 25 and 30°C.

In the natural soil stored at 30°C. with moisture at the field percentage, only 10 ppm, or 8% of the herbicide, remained after 2 weeks. (Dept. Botany, Iowa Agr. Exp. Station, Ames.)

Movement of sodium chlorate in soils following treatment. Coupland, R. T. and Phenix, T. S. A dense stand (275 shoots per sq. meter) of leafy spurge (Euphorbia esula) was treated on sandy soil with sodium chlorate at 3, 6 and 9 lb. per sq. rod in water, 1 lb/gal. on June 26, 1952. Cores of soil were removed to a depth of 6 ft. at approximately monthly intervals during the 1952 and 1953 growing season and analyzed for chlorate content in each soil layer. The proportion of the chlorate found in the top 3 in. of soil varied from 29 to 53% during the first season, but none was present during the second season after. The proportion of the chlorate found in the top 12 in. of soil ranged from 76 to 100% during the first season but decreased markedly in 1953 from 32 to 72% in the spring to 0 to 15% on Oct. 27. Chlorate in the second foot of soil varied from 0 to 19% during the first season and from 0 to 85% during the second. Similar data for the third foot were 0 to 5% and 0 to 38%, respectively. The toxicant reached the fourth foot during the 2nd season but only from the 6 and 9 lb. applications. By October, 1953, 4% of the toxicant was in the fifth foot of the 6 lb. rate and 22% of that recovered was in the fifth foot of the 9 lb. rate. The sixth foot was reached by a small amount of chlorate. A similar experiment using 6 lb. rates with from 0 to 30 gal. of water per sq. rod indicated that the heavier water application increased the rate of leaching but not the maximum depth. (Dept. of Plant Ecology, Univ. of Saskatchewan, Saskatoon)

The germination of leafy spurge seed after treatment of an infestation with a sodium chlorate compound. Selleck, G. W. and Coupland, R. T. Application of a sodium chlorate compound in the years 1949 and 1950 at Esterhazy inhibited the growth of shoots from roots of leafy spurge in 1951, but permitted the germination of seed. On May 27, 1951, 5 quadrats, each one square-decimeter in size, were counted in the infested area. The seedlings were 1 1/2 inches tall and the average density was 28/dm^2. One month later the average number of seedlings had decreased, and those remaining (3 inches high) were lacking in vigor, stunted and chlorotic. By September 12, 1951 the number of seedlings had decreased to 5/dm^2. These appeared to be vigorous, reaching a height of 11 inches. (Dpet. of Plant Ecology, Univ. Saskatchewan, with financial aid of Science Service, Canada Dept. of Agric.)

The relative toxicity of sodium chlorate in various Saskatchewan soils. Coupland, R. T. and T. S. Phenix. Biological test were conducted with 15 Saskatchewan soils to ascertain the relative toxicity of sodium chlorate. The toxicity of the herbicide decreased with increase in the productivity of the soil. The herbicide was approximately three times as toxic at 5 to 80 ppm. in the least productive as in the best one. In another experiment the antagonistic effect of sodium nitrate on the toxicity of sodium chlorate was demonstrated. (Dept. of Plant Ecology, Univ. Saskatchewan.)

The influence of 2,4-D and nitrogen fertilizer on the total nitrogen and nitrate-nitrogen contents of several plant species. Furrer, J. D. In july 1951 pigweed (Amaranthus sp.), wild mustard (Brassica arvensis), velvetleaf (Abutilon theophrasti), crabgrass (Digitaria sp.) and sudan grass (Sorghum vulgare) were seeded on Waukesha silty loam at Lincoln, Nebraska. Ammonium nitrate was applied at rates of 0, 60 and 120 pounds of nitrogen per acre. 2,4-D was applied to the plants at 0, 1/8, 1/4, and 1/2 pound per acre thirty days after seeding. All treatments were replicated 4 times. Plant samples were collected 3 days after the 2,4-D treatments and dried. Total nitrogen content by the Kjeldahl method and nitrate-nitrogen xxx content by a phenoldisulfonic acid method were determined. The application of ammonium nitrate resulted in highly significant increases in nitrate-nitrogen percentages of all species to amounts that exceeded the minimum level toxic to livestock. The nitrogen fertilizer tended to increase the nitrate-nitrogen content and not the organic nitrogen content. 2,4-D had no significant effect upon the nitrate-nitrogen or total nitrogen contents of any of the plant species. There was a tendency for the nitrate-nitrogen content of all species, except velvetleaf, to be reduced with applications of 2,4-D. The lower rates of 2,4-D tended to result in slightly increased nitrate-nitrogen content of velvetleaf. Applications of 2,4-D tended to depress the total nitrogen contents.

In July 1952 2,4-D applications of 0, 1/8, 1/4, and 1/2 pound per acre were made on pigweed (Amaranthus sp.), velvetleaf (Abutilon theophrasti), foxtail (Setaria sp.), sunflower (Helianthus annuus), giant ragweed (Ambrosia trifida) and annual smartweed (Polygonum pennsylvanicum) growing on soil containing residual nitrogen from applications made in 1951 at rates of 0, 60, and 120 pounds of nitrogen per acre. All treatments were replicated 4 times. All plant species had made excellent growth and were in the flowering stage or approaching that stage of growth. Samples were collected, dried and analyzed as in the previous year. Residual nitrogen had a marked effect upon the growth and dry matter production of all plants. There was no significant effect of either residual nitrogen fertilizer or 2,4-D on the total nitrogen of nitrate-nitrogen content of any of the species. The levels of total nitrogen and nitrate-nitrogen contents were less than those obtained the previous year. All species had lower nitrate-nitrogen content than the minimum level toxic for livestock. (Contribution of Dept. Agronomy and Agric. Extension Service, Univ. Nebraska)

Variations in starch reserves of underground parts of toadflax (Linaria vulgaris from May to November, 1953. Zilke, S. and Coupland, R. T. The underground parts of toadflax were taken at intervals from 4 locations in an infested field at Rosthern. The material was tested to determine the proportion subject to hydrolysis by HCl. The first set of samples was obtained on May 20 during shootemergence. They had an average of 17.7 per cent of acid-hydrolizable carbohydrate on a dry weight basis. The samples taken during June and July represent the period during which most of the vegetative growth was taking place. These samples showed slight increases, being 18.2 per cent on June 6, 18.2 per cent on June 24, and 18.5 per cent on July 22. There was a considerable increase during the following month while flowering and fruiting took place, being 19.6 per cent on Sept. 13. During the next few weeks the vegetation was drying up but flowering and fruiting continued. The acid-hydrolizable content showed a sharp decline, being 17.3 per cent on October 2. In late fall the acid-hydrolizable content increased, being 19.9 per cent on November 18. Changes in carbohydrates during the growing season are relatively small, being similar to those in couch grass. [But cf. next abst., Ed.] (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from The Sask. Agric. Res. Foundation.)

Variations in the dry weight of underground parts of toadflax from May to November, 1952. Zilke, S. and Coupland, R. T. Underground parts of toadflax were taken at intervals throughout the season, and the percentage dry weight obtained. The results showed that the percentage of dry weight declined in early summer and then increased steadily till late fall. On May 2, 1952, when the adventitious shoots were emerging, the dry matter content was 36.2 per cent. By July 10 when the toadflax was in early bloom the dry matter content had declined to 23.2 per cent. On August 8, when in full bloom, the dry matter content had increased to 27.7 per cent. The dry matter content continued to increase thereafter, being 30.5 per cent on September 24 when the toadflax was largely in the seed stage, and 38.2 per cent on November 3, at the end of the growing season. (Dept. of Plant Ecology, Univ. of Saskatchewan, with financial aid from Science, Service, Canada Dept. of Agric.)

Primary dormancy and germination requirements of seeds of certain Cruciferae. Steinbauer, G. P., and Frank, Peter. In a continutation of a study of dormancy and germination of seeds of crucifers previously reported in Res. Rpt. 9th N.C.W.C.C., p. 160, it was found that primary dormancy persisted for as short a time as 3 wks. for Brassica campestris to a year or more for Brassica kaber, Brassica nigra, and Lepidium virginicum. Detailed information as to length of the dormant period and the optimum germination conditions among those supplied are given in Proc. Assoc. Off. Analysts 1954 (in press). (Contr. 54-7 Dept. Botany and Plant Path., Mich. State College.)

Effect of various chemicals on the germination and subsequent growth of wild oats (Avena fatua), stinkweed (Thlaspi arvense), and wild mustard (Brassica arvensis). Shebeski, L. H., and Burrows, V. D. For this experiment greenhouse flats were used. In one series of flats the seeds of the 3 weed species were placed in rows on the soil surface. In the second series, the seeds were placed in rows 3/4 - 1" below the soil surface. One flat from each series per chemical was sprayed with the following chemicals: 2,4-D (amine salt, butoxy ethanol ester, butyl ester), MCP (amine salt, sodim salt, butyl ester), 2,4,5-T (a low volatile ester), 3,4-D (amine salt), IPC, and untreated checks. The nine chemicals were applied at 5 lbs./A in 5 gal. of water. Two hours after treatment the flats were watered. Prior to watering the surface borne seeds were covered with 3/4 - 1" of soil. In all the flats except the IPC treated and untreated checks, the wild mustard and the stinkweed did not emerge.

The germination was high but the seedlings were so badly deformed that they did not emerge. The results with wild oats were very interesting. No emergence of wild oats occurred in the IPC treated flats. About 20 - 30% reduction in emergence of wild oats resulted in the 2,4-D, MCP, and 3,4-D treated flats. 2,4,5-T caused only a very slight reduction in emergence. The wild oat seedlings in the IPC treated flats rotted before emergence, which is typical of this herbicide. Seedlings of wild oats in the 2,4-D and MCP treated flats failed to produce roots from the basal end of the seed, but later the secondary root system developed and the plants recovered. The chemical 3,4-D caused the wild oats to behave in an interesting manner. Like 2,4-D and MCP, it inhibited the development of primary roots from the basal end of the seed. The seedlings emerged but never grew past the one-leaf stage. Examination of the seedlings revealed that the secondary root system had not formed. It appears that 3,4-D inhibits the development of secondary roots, and certainly warrants further testing to establish its usefulness in weed control. (Div. of Plant Science, Univ. Manitoba.)

Germination and dormancy of leafy spurge seed in soils of various textures. Selleck, G. W. and Coupland, R. T. Duplicate, randomized samples of 200 seeds each of leafy spurge (Euphorbia esula) were sown in Saskatoon soil and in soil from their respective habitats in the fall of 1951. Soil textures ranged from sandly loam to heavy clay from 7 locations. Out of 6400 seeds planted, 14.5 % grew the first year, 6.1 % the second and 0.81% the third, a total of 21.48 %. However, 97 % of the seedlings produced from the Hague seed collection germinated the second year after planting. The highest germination (46 %) was obtained from seed one-year old. Seed from the same location (Battleford) planted the same year it was harvested, germinated 32 %. The lowest germination from an average of two samples was 4.75 %. Ninety-five % of all germination occurred before the end of May of each season, although seeds continued to sprout throughout the summers until October 15. With one possible exception, a greater proportion of leafy spurge seeds germinated on lighter soil textures. Trends were similar for each of the three years. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

Imbibition of water by seed of leafy spurge prior to germination. Selleck, G. W. and Coupland, R. T. Brown and grey seeds of leafy spurge (400 each) collected at Battleford and Duck Lake, Sask. were placed on moistened paper in petri dishes to ascertain imbibition prior to germination. The samples of brown seed averaged 11.5 % heavier than samples of grey seed. The greatest increase in weight occurred within 24 hours after the addition of water, with an average increase of 26 %. The maximum weight occurred at 96 hours with an average increase of 30%. At this stage, Battleford seed began to germinate and no further weights were taken. Seed from Duck Lake was weighed daily for 4 additional days. Only slight variation in weight occurred. In a similar experiment, samples were weighed 4 times the first day and twice each day following. The most rapid increase in weight occurred during the first hour, with an average increase of 10%. After 7 hours, the average weight increased to 17%. After 48 hours, the seed began to grow, having gained an average of 26 % in weight. In the two experiments, the ave age imbibition of grey seeds surpassed that of brown seeds by 37.5%. In the third experiment, seeds placed in water continued to imbibe for 100 hours, with a gain of 46% and little difference between the brown and grey seeds. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effect of temperature on the germination of seed of leafy spurge. Selleck, G. W. and Coupland, R. T. Experiments were conducted in the laboratory to ascertain the effect of temperature on germination. Samples of 100 seeds each were placed on felt in petri dishes for a period of 2 weeks. The percentage germination of newly-harvested and one-year old seed increased slightly at 30° compared with 20°C. in 1951. In 1952, germination of seed of 3 ages each increased almost 100 per cent at the 30°C. treatment. Two weeks at 20°C. followed by 2 weeks at 30°C. afforded the most complete germination for seed of 3 ages. Seed one-year old germinated 87 %. It was found in 1953 that alternating temperatures of 20°C. and 30°C. every 48 hours for a period of two weeks was also effective. Four samples of 100 seeds each averaged 84 % germination, compared with 40 % at a temperature of 30°C. for 2 weeks. Only one seed out of 400 germinated at temperatures ranging between 8° and 12°C. over a period of 2 weeks. At the other temperature extreme, 6 samples of 100 seeds each averaged 18 % germination at 40°C. No germination occurred at 45°C. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effect of light and alternate wetting and drying on the germination of seed of leafy spurge. Selleck, G. W. and Coupland, R. T. Newly-harvested seeds of leafy spurge were tested for germination on felt paper in petri dishes in the laboratory at Saskatoon. Half of the samples were kept moist continuously, while the other half were alternately moistened and dried at weekly intervals for a period of 3 weeks. Seed of the latter treatment germinated an average of 47% surpassing the checks by more than 200 per cent. The results were similar for both the heavier brown and smaller grey seeds. In the laboratory, little germination occurs after the seed has been subjected to favorable conditions of moisture and temperature in excess of two weeks. A change in these conditions often promotes further germination.

Germination in the dark consistently surpassed germination in the light by an average of 19.7%. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effects of age, weight and flooding conditions on the germination of seed of leafy spurge. Selleck, G. W. and Coupland, R. T. Seed of leafy spurge from newly-harvested to 13 years old, was germinated in petri dishes at room temperature. The highest germination (40%) occurred with seed one-year old. This has been consistent in all experiments conducted in the laboratory and in the field. Seed 5-years old germinated 26 %. Although every sample produced seedlings, the oldest seed was least viable.

Newly-harvested and one-year old seed was placed in petri dishes in one-half inch of water. Eight % of the newly-harvested seed submerged immediately, while the remainder floated on the surface. After 5 days, 3 % had germinated, and approximately 60% of each sample had settled to the bottom. After 14 days, all of the seed had submerged and an average of 13.5% had germinated. Some of the seeds germinated on the water surface; others produced sprouts after they had submerged. Similar results were obtained when the experiment was repeated.

One thousand each of brown and grey seeds from the same seed collection were tested for germination under various conditions. The brown seeds were larger and heavier, weighing 377 mg. compared to 325 mg. per 100 seeds. The average germination of the grey seed was slightly higher, but the difference was not significant. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effect of scarification and depth of planting on the germination of seed of leafy spurge. Selleck, G. W. and Coupland, R. T. Duplicate samples of 200 seeds each of leafy spurge were scarified and planted in the field at Saskatoon in 1951. In one treatment the seed coats were damaged with sandpaper. In the other, the seed was shaken vigorously in a quart sealer for a period of one minute. Ten % of the seed germinated the first year and increased to 15 % the second. Germination was negligible the third year. Seed germination in the check plots surpassed the germination of the sandpaper and sealer treatments by 17 and 209 %, respectively.

Seeds of leafy spurge, newly-harvested and one-year old, were planted in the field at Saskatoon at 6 depths varying from the surface to 3 inches. Thirty-three % of the seed germinated the first year, increasing to 36 % the second. Only one seed germinated the third year. Averaging the numbers of germinating seeds planted at the same depths showed that seed of the surface had the lowest germination. Germination increased with depth until a peak of 60 % was reached at a depth of one inch. It then decreased with increased depth of planting to 35.5 % at 3 inches. With one exception, more complete germination occurred with one-year old seed. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effect of clonal differences and date of seed collection on germination of seed of leafy spurge. Selleck, G. W. and Coupland, R. T. Seed of leafy spurge collected from different Saskatchewan sites in the same year differs markedly in viability. Seeds were placed in petri dishes at a temperature of 30°C. Two hundred seeds each collected from Mortlach, Battleford, Duck Lake and Mozart germinated 67, 42, 6 and 1% respectively. Viability also varies in seed collected at the same site on different dates. Two hundred seeds each from Mortlach collected in July and September germinated 67.5 and 26%, respectively. Similar trends occurred with seed collected at Duck Lake in August and September. All of the seed appeared to be mature. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The effect of DNBP and CIPC on the germination and subsequent root elongation of soybeans and cotton. Smith, Roy J., Slife, F. W. Many times when heavy rainfall follows the application of pre-emergence treatments, the herbicides are leached down into the crop seed or crop root zones, consequently causing injury to the crop. This is especially the case when the soils treated with the herbicides are light in texture. The objective of this study was to evaluate the effects of CNBP and CIPC on the germination and subsequent root elongation of cotton and soybeans.

Three 9 cm. filter papers were placed in the bottom of 4 in. petri dishes and 15 crop seeds, either cotton or soybeans, were placed on the filter paper. To each petri dish, 7 cc of the appropriate herbicide were added. There were 4 replicates of the follwoing concentrations: 0, 1, 5, 10, 25, 50, 100, 200, 400, 800, 1600 ppm. The dishes were then placed in the incubator at 28 - 30 degrees C for 96 hours, after which they were removed from the incubator. The number of germinated seed and the length of the primary roots were recorded. The data were analyzed statistically.

Results: Effect on germination: In general, both DNBP and CIPC at all rates inhibited the germination of soybeans more than they did cotton. DNBP was more inhibitory to both crops than was CIPC. It was not until 25 ppm. was reached that inhibitory effects appeared. CIPC caused no inhibition to soybean or cotton germination even at a concentration of 1600 ppm. DNBP caused 100% kill of soybeans at concentrations of 400 ppm. and above; it reduced cotton germination to 15% at a concentration of 1600 ppm.

Effect on root elongation: Soybeans grown in contact with CIPC and cotton grown in contact with DNBP and CIPC reacted in a similar fashion, i.e., as the concentrations of these herbicides increased from 25 - 1600 ppm. they inhibited, gradually, the growth of the primary roots. However, soybean roots grown in contact with DNBP were inhibited rapidly as the concentration increased. Since all the soybeans were killed at DNBP concentrations of 400 ppm and above, there was no root growth at these rates.

These data appear to indicate that if these two herbicides are leached into the crop seed zone during germination, the DNBP will be much more injurious than CIPC to the germination of the crop. (Contribution Ill. Agr. Exp. Sta., Dept. of Agron.)

The effect of CNBP and CIPC on the growth and recovery of soybeans when these herbicides were applied to soybean seedlings which were of different ages. Smith, Roy J., Slife, F. W. This experiment was conducted during the winter and spring of 1954. A gravel-nutrient culture was used as a medium for growing the soybeans. A 5 gal glass jar filled with a modified Hogaland's nutrient solution supplied the nutrients to three 2-gal glazed pots which were filled with quartz gravel. The nutrients were pumped automatically from the 5-gal jar to the 3 pots 8 times daily by employing a compressed air system controlled by an electric time clock.

Soybean seeds were planted in moist sand in such a sequence as to allow them to be in the germinating, crook, and cotyledonary stages on the same day. In transplanting the soybeans from the moist sand to the gravel-nutrient pots, each of the 3 pots supplied by a single jar of nutrient solution contained a separate stage of soybeans. On the day the soybeans were in their respective stages, the nutrient jars were replaced by jars of DNBP and CIPC, each at concentrations of 10 and 20 ppm. Certain of the nutrient jars were replaced by jars of distilled water which served as controls. Each treatment was replicated twice. These herbicidal solutions and water were supplied to the soybeans for 3 days, after which they were replaced by the nutrient solutions for the remainder of the experiment. The green weight of the soybean shoots and roots and the length of the soybean shoots were taken at 14 and 28 days after the removal of the herbicidal solutions from contact with the soybeans. The data were analyzed statistically.

Results: Both DNBP and CIPC showed similar inhibition on both soybean shoots and roots as indicated by shoot and root green weight and shoot length measurements. The application of either DNBP or CIPC reduced the growth of the soybeans as indicated by a comparison between treated and control. In general, CIPC caused much more inhibition to soybean growth than did DNBP. The germinating stage was affected most, the crook stage less, and the cotyledonary stage least by applications of these two herbicides. The recovery of soybeans from DNBP was rather rapid, while the recover from CIPC was much slower, and this was especially true when the 20-ppm rate was applied to the younger growth stages.

These results seem to indicate that if the herbicides, DNBP and CIPC, are leached down into the crop root zone after germination of the soybeans, the CIPC will cause more injury than DNBP to the crop. However, as the soybean seedlings become older, the chemicals cause less inhibition to the soybeans. (Contribution Ill. Agr. Exp. Sta. Dept. of Agron.)

Occurrence of black medic (Medicago lupulina) in a flower seed mixture. Coupland, R. T. Medicago lupulina was abundant among the plants produced from one of 16 flower mixtures grown at Saskatoon in 1954. This seed collection, which was obtained from a Western Canadian seed house, was called "rock garden, perennial flowers mixed." (Dept. Plant Ecology, Univ. Saskatchewan, Saskatoon.)

Occurrence of Linaria dalmatica in flower seeds. Coupland, R. T. and Frankton, C. Linaria dalmatica was found to be the species represented in two packages of flower seeds grown at Saskatoon during 1954. One of these, called "perennial snapdragon," was purchased from a reputable seedsman in Eastern Canada. The second, called "yellow snapdragon," was advertised for sale by a housewife in a farm weekly newspaper. Seeds sown in mid-May produced flowering plants by mid-August. (Dept. of Plant Ecology, Univ. Saskatchewan and the Division of Botany and Plant Path., Science Service, Canda Dept. Agric.)

Increased abundance of annual weed species in Saskatchewan. Coupland, R. T., Selleck, G. W. and Zilke, S. Based on the number of enquiries which have been received about them and the observations made during the Saskatchewan Weed Survey, hemp nettle (Galeopsis tetrahit) and darnel (Lolium persicum) appear to be increasing in abundance at a marked rate in Saskatchewan. The presence of the former has particularly been noted in the Tisdale area, but fields have been found to be badly infested in other parts of the northeastern section of the settled region of Saskatchewan. Darnel is abundant in many fields in the brown and dark-brown soil zones, serious infestations have been reported from Aylesbury, Cando, Coronach, Davidson, Dinsmore, Drake, Gregherd, Hudson Bay, Kenaston, Senlac, Shaunavon and Yellow Grass. Hawk's beard (Crepis tectorum) is also becoming abundant in northern parts of the settled area of Saskatchewan. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon.)

The occurrence of absinthe as a weed in Saskatchewan. Coupland, R. T., Frankton, C. and Zilke, S. During the Saskatchewan Weed Survey the abundance of Artemisia absinthium var. insipida was noted in the Salvador-Luseland-Denzil area and in the Cypress Hills northwest of Eastend. The plant is very aggressive in these areas and has invaded cultivated land. During 1954 specimens were collected from the following areas in which the weed was considered to be troublesome: Allan, Elbow, Lanigan and Montreal Lake. Smaller infestations were found at Hepburn and Limerick. (Dept. of Plant Ecology, Univ. Saskatchewan, and the Division of Botany and Plant Path., Science Service, Canada Dept.)

The abundance of persistent perennial weeds in Saskatchewan. Coupland, R. T., Selleck, G. W. and Zilke, S. During the six years of the Saskatchewan Weed Survey the following infestations have been mapped in the 104 municipalities surveyed (approximately 30% of the settled area of the province):

Species	No. of infested Municipalities	No. of infested quarter sections	Acres mapped
Leafy spurge	74	703	7,706
Toadflax	78	4,489	134,327
Hoary cresses	32	105	1,351
Russian knapweed	33	107	1,899
Field bindweed	46	332	4,679
Total		5,736	149,962

(Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. of Agric. and the Sask. Agric. Res. Foundation.

The dynamics of growth of perennial weed patches. Zilke, S. and Coupland, R. T. Measurements of the increases in the diameters of toadflax patches of various sizes have been made at permanently established study sites in Saskatchewan. Also observations on the relation between the size and number of patches were recorded by the Saskatchewan Weed Survey. Both measurements and observations have shown that the number of patches of a perennial weed rather than the size of a patch determines the potential threat to a field. For example, a patch of toadflax 0.71 sq. meter in area increased in extent by 418% in one season, while a patch of 274 sq. meters increased by only 14%. Generally, the smaller the patch the greater was the percentage increase in the area. As the area of the patch increased there was a correspondingly lower percentage increase in area. Therefore, the number of patches rather than the size of a patch, determines the rate at which a field becomes infested. An example of this process is the increase of toadflax in one quarter section near Luseland in which the extent of the infestation increased over a 5 year period from numerous patches and individual stalks, totalling 1 acre in area, until it occupies 85 acres in the 110 acre field. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon, with financial aid from Science Service, Canada Dept. Agric.)

Non seed-bearing infestations of leafy spurge in Saskatchewan. Selleck, G. W. Zilke, S. and Coupland, R. T. More than 8,000 acres of leafy spurge have been mapped in Saskatchewan by personnel of the Saskatchewan Weed Survey since 1949. Infestations on 3 quarter sections (of more than 675 infested) located at Esterhazy, Wynyard and Herbert were found to produce no seed. The infestations at Wynyard and Herbert are each confined to one small patch, while the infestation at Esterhazy has been spread by machinery to cover over 15 acres. At Esterhazy, both seed-producing and non seed-producing types are present, the latter type being predominant over the area. The few plants which produce seed appear to be confined to the grassy perimeter of the slough. Close observation of sterile inflorescences revealed that in each case, male flowers failed to appear. (Dept. of Plant Ecology, Univ. Saskatchewan.)

Successive stages in the development of the inflorescence of leafy spurge in Saskatchewan. Selleck, G. W. and Coupland, R. T. Observations were made on leafy spurge growing in pots in the greenhouse at Saskatoon. The development of the inflorescence progresses in successive stages. A term was assigned to each stage to assist in description. The opening of terminal leaves of the bud is followed almost immediately by the opening of the "center" bracts. This reveals a female flower arising from the center of a cyathium. When the female flower is absent, the cyathium dies within two days. Between 5 and 13 buds may be found to arise at the base of the center female flower (or where it should be). The development of these buds, the elongation of the pedicels and the opening of the bracts produces an umbel in the "center-paired" stage. At the base of the center-paired female flower two further buds arise. The opening of the bracts reveals "paired" female flowers. Similarly, at the base of each of these, two "octet" flowers are produced, and occasionally development of a further stage produces two "duo-octet" flowers. Each pedicel of the original umbel may rebranch to form 16 pedicels at the duo-octet stage. Occasionally only one member of a pair will develop in the last two stages. Two to 4 days elapse between the opening of the center and center-paired bracts. Each successive stage is initiated at 6- or 7-day intervals. The development of the inflorescence may terminate at any one of the stages. Lateral inflorescences may occur simultaneously with the terminal one, but usually develop later. Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

A stage of development in the inflorescence of leafy spurge. Selleck, G. W. and Coupland, R. T. Notes were taken on the development of the inflorescence of leafy spurge planted in pots in the greenhouse at Saskatoon. The plants received 13 hours of light daily. The "center-paired" bracts open 2 to 4 days after the opening of the terminal leaves, revealing an erect female flower located in the center of a cyathium. The cyathium consists of 4 nectar-secreting glands. The three stigmas of the female flower open the 2nd day after its emergence, making it receptive to pollen. The pedicels of the center-paired cyathia elongate, reaching 1/2 inch in 3 days; 1 inch in 11 days. After 3 days the female flower becomes inverted in the space between the glands. This inversion is usually accompanies by one or two male flowers appearing at the base of the female flower. Sometimes a male appears just prior to the inversion of the female. On each of the 4th and succeeding days, from 2 to 5 more males may appear, until between 11 and 20 have been produced. Sticky orange pollen may be found on the anthers one day after emergence. The occurrence of male flowers is accompanied by the secretion of a colorless, sticky nectar by the glands of the cyathium. The male flowers last 2 or 3 days, at which time they become detached at the base and fall. If the females are not pollinated, they die within 7 to 10 days after their emergence. If the females are pollinated (probably by insects) the capsules develop to full size within 10 days after the opening of the bracts. The ripe seed is dehisced 19 to 21 days later. The development described is duplicated by other flowers within the same stage of development and repeated by each successive stage. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

Pollination in leafy spurge. Selleck, G. W. and Coupland, R. T. The female flower appears first in the development of the inflorescence of leafy spurge followed by the appearance of a male flower at its base within 24 hours. Usually the female flower becomes inverted before any male flowers appear, but occasionally inversion occurs after one male flower is present. This suggests that pollen transfer and self-pollination is not impossible. The following facts indicate that pollination is achieved almost entirely by insects. The female flower becomes inverted, avoiding contact with male flowers. The male flowers dehisce pollen which clings in sticky masses. The involucral glands produce nectar which is sought by insects. Nectar production corresponds with the emergence and pollen production of the male flowers. In the greenhouse at Saskatoon, no seed has been produced unless the female flowers were artifically pollinated. Each of 30 shoots were isolated with 28-mesh screen in the field at Saskatoon. With the exception of four shoots no seed was produced on inflorescences not previously exposed to insects. On one of these shoots an ant was observed crawling over the inflorescence beneath the wire screen. Inflorescences on the other three shoots may have been pollinated in the same manner. It is believed that insects visit the inflorescences of leafy spurge to feed on the nectar, accidentally executing pollination in the process. (Dept. of Plant Ecology, Univ. Saskatchewan.)

The length of time required for leafy spurge to produce seed. Selleck, G. W. and Coupland, R. T. Seed of leafy spurge planted at Saskatoon in May, 1951 produced no inflorescence or seed during the first season. Similar development occurred at Esterhazy in an established infestation. Seed production occurred from shoots orginating from roots which were established one season or more. The first seed was disseminated in mid-June, approximately a month and a half after emergence of the shoot. Ripe seed was produced 31 days after appearance of the inflorescence.

In the greenhouse at Saskatoon, with 13 hours of light each day, shoots from roots sections produced an inflorescence 20 days after emergence, and disseminated seed 30 days after the appearance of the inflorescence. One shoot flowered 18 days after emergence, while another produced ripe seed within 25 days of the appearance of the inflorescence. With further development of the terminal inflorescence and lateral branches, seed production generally continues until freeze-up. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. of Agric.)

The seed yield of leafy spurge in Saskatchewan under various conditions. Selleck, G. W. and R. T. Coupland. The number of seed capsules per shoot of leafy spurge was counted on numerous shoots of leafy spurge in various habitats in Saskatchewan. On the basis of an average density of 100 flowering shoots per square meter and an average weight of 250 mg. per 100 seeds the potential yield was calculated to average between 200 and 400 pounds per acre. Great variation in yield occurred from season to season, with maximum reduction occurring under adverse moisture conditions and in competition with vigorous perennial grasses. Crested wheatgrass (Agropyron cristatum) was the most consistent competitor in its ability to suppress the seed yield of leafy spurge. The effect of native grass on yield was not consistent. On sandy-loam soil, leafy spurge produced 24 pounds of seed per acre on a cultivated field at Duck Lake, and 379 pounds per acre in competition with brome grass (Bromus inermis) at Battleford. At Mortlach, on sandy loam soil in competition with annual weeds, leafy spurge yielded 496 pounds of seed per acre in 1951, 98 pounds in 1952 and 45 pounds in 1953. The seed yield in competition with crested wheatgrass was reduced by 11%, 84% and 55% respectively. Under favorable conditions, phenomenal yields may be obtained. At Ituna in 1953, in competition with native grass, leafy spurge yielded 3400 pounds of seed per acre, the bulk of which was produced from numerous lateral inflorescences. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The size of the patch of leafy spurge in relation to its rate of spread. Selleck, G. W. and Coupland, R. T. The rate of spread of leafy spurge by roots in Saskatchewan averaged 1.66 ft. in 1952 in various habitats. At some points of measurement, no increase occurred, while at others, the perimeter extended radially as much as 6.5 ft. The percentage increase in area is closely associated with the size of the patch. A path occupying 0.8 sq. ft. increased in area by 499% during a period of 12 months. Patches occupying 595 and 2413 sq. ft. increased their areas by 30 and 21%, respectively. Considering an annual increase of 20% 30,000 sq. ft. of leafy spruge consisting of 15 patches each 2,000 sq. ft. in area, would occupy approximately one acre in 2 years. A similar area consiting of 60,000 scattered patches each 0.5 sq. ft. in area and increasing 600% annually would increase to approximately 34 acres within the same length of time. This does not consider seed production as contributing to the rate of spread. The average production of seed in Saskatchewan appears to be between 200 and 400 pounds per acre, with an average of 13.5% of the seed germinating the first year. The dehiscense of the capsule is capable of hurling the seeds distances from 12 to 15 ft. A small patch of leafy spurge may utilize a considerable proportion of the seed produced for radial expansion, without the aid of any other agency of distribution. In large infestations, only the plants situated about the perimeter may play an active role in radial expansion by either root or seed. Coupled with the fact that complete eradication of leafy spurge is economically practicable only with small patches, the urgency of dealing with new, small infestations is apparent. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon, with financial aid from Science Service, Canada Dept. Agric.)

Seed production and dispersal of Russian knapweed in Saskatchewan. Selleck, G. W. and Coupland, R. T. The white seeds of Russian knapweed (Centaurea repens) are produced in a capitulum, covered by and surrounded with white, silky hairs at maturity. There appears to be no union between the pappus and the achene. The involucral bracts remain closed during and after seed maturity. Consequently the pappus appears to be of little assistance in seed dispersal. The heads and stems remain intact, permitting collection of seed one or two years after maturity. Weathering and decomposition of stems and heads bring the seed in contact with the soil. The heads containing seed may be distributed by flowing water. The flooding of the Saskatchewan River at Leader in 1953 transported a head of Russian knapweed 40 yards from the nearest infestation. A few days after the recession of the water 8 seedlings were developing from the center of the head. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon.)

The effect of one cultivation on the density of toadflax (Linaria vulgaris). Zilke, S. and Coupland, R. T. At Mortlach, Sask., a group of toadflax patches about 40 feet in diameter a few rods apart was selected for this experiment. Of two patches, beside each other, one was dug up completely (at a depth of 6 inches) in early July, 1951, while the other was left undisturbed. In another patch a strip was dug up across the central portion of the patch. In 1952, 1953, and 1954 the density of the toadflax was measured on the disturbed and undistrubed patches in early July. In each successive season since the cultivation the density of the toadflax on the distrubed area has been greater than on the undistrubed, being an average 146.0 per cent greater in 1952, 148.4 per cent greater in 1953, and 148.5 per cent greater in 1954. This is similar to what has been found by Rice and Penfound in regard to yield of above ground parts of plowed native prairie compared to the undisturbed condition. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from the Sask. Agric. Res. Foundation.)

Seed production of toadflax in Saskatchewan in 1952. Zilke, S. and Coupland, R. T. Material was collected and data derived from measurements made at sites established in various parts of the province for the study of the life history of toadflax. It has been observed that seed production in this species is dependent particularly on the number of flowers produced per flowering stem and the length of the season. A late spring combined with early fall frosts, as in 1954, greatly reduced seed production. In 1952 the greatest number of flowers per inflorescence was 30, the smallest 9, and the average 20. The proportion of flowers developing fruits was 56%. The largest number of seed capsules produced per inflorescence was 23, the smallest number was 1, and the average 11.2. The number of seeds per capsule ranged from 20 to 138 while the average was 64.3. The average seed production per flowering stem was 5,584. At the end of a season 85 per cent of all shoots in a patch have flowered and fruited. The estimated seed production of a patch 6 meters in diameter in 1952 was 1,764,210 seeds. A patch 10 meters in diameter in 1952 produced an estimated 6,618,345 seeds. The seed yield per acre was estimated to be 363,636,363 seeds weighing 152 pounds. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. Agric.)

The role of seed in the spread of toadflax. Zilke, S. and Coupland, R. T. Observations were made by the Saskatchewan Weed Survey and data were compiled from the records of this survey on the probable role of seed in the extensive spread of this weed. Of 43 rural municipalities having isolated toadflax patches, 10 had them in gardens while the other 33 had them in all other types of habitats. Forty-one % of the latter occurred in cultivated fields while 46.5% occurred on road rights of way. These patches were in most cases at a considerable distance from other toadflax patches, and consequently, most of them must have originated from seed.

The isolated character of many patches in fields suggests the carriage of seed by farm implements, seed grain, and by farm trucks rather than migration by natural agents. The high incidence of isolated patches along roads, where there is a great deal of vehicular traffic as well as soil disturbance, would seem to indicate that road traffic is one of the important agents in the distribution of seed, with consequent infestations in former toadflax free regions. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid from Science Service, Canada Dept. of Agric.)

The reproductive capacity of toadflax by seed. Zilke, S. and Coupland, R. T. Material for the determination of seed production of toadflax was collected at various sites in Saskatchewan established for studying phases of the life history of this species. Seed for germination tests was collected at the sites and other parts of the province. Germination of the seed under field conditions was carried out at Saskatoon. Reproductive capacity depends on two factors, the rate of seed production and the percentage of germination. The average seed production per flowering stem was 5,584 in 1952. The average germination of seed under field conditions in Saskatchewan in 1952 was 1%. This gives an average reproductive capacity by seed of a single flowering stem, calculated according to the Salisbury method, of 5. The calculated potential average reproductive capacity is 362. A patch 10 meters in diameter would have an average reproductive capacity of 66,183 seedlings per year. If this patch is six years old or over, the patch will have an average reproductive capacity of 5,162,309 seedlings per year because of the accumulation of seed. (Dept. of Plant Ecology, Univ. Saskatchewan, with financial aid for Science Service, Canada Dept. Agric.)

The status of toadflax as a weed outside Saskatchewan in 1953. Zilke, S. and Coupland, R. T. To ascertain where toadflax was a problem, letters of inquiry were sent to various parts of the world. The replies indicated that this weed occurs in every province in Canda but that only in Saskatchewan and Alberta are expensive control measures required. Some infestations occur in British Columbia, Manitoba and Ontario, but in the other provinces the weed is of little consequence. In the U.S.A. the weed occurs in most of the states but is considered of importance only in Montana and Idaho. Field infestations occur in Oregon, Colorado, New York and Pennsylvania. In the parts of continental Europe from which replies were received this species is reported to be part of the native flora but occurs as a weed chiefly along roads and railways. The weed occurs in fields in East and West Germany, Austria, Sweden and Finland, for instance, but good field husbandry brings it readily under control. In Norway results of a weed survey showed that 26 of the 71 farms investigated had toadflax but none required special control measures. In Switzerland it was found present 9 times in 1000 field analyses but is considered of no consequence as a weed. Toadflax is not reported from Argentina, Uruguay, Peru, or Brazil. In Australia this species occurs in two states but is of no importance as a weed. In the Union of South Africa toadflax occurs on the High Veld but is of no consequence as a weed. The replies received indicate that the only part of the world having serious difficulties with toadflax is the prairie provinces in Canada. (Dept. of Plant Ecology, Univ. Saskatchewan.)

Growth development at Saskatoon of Linaria dalmatica from various sources. Coupland, R. T. and Alex, J. F. Seeds of Linaria dalmatica from 21 sources were planted at Saskatoon in mid-May, 1954. These were obtained as follows: 11 from the State of Washington, seven from Saskatchewan, and one from each of Alberta, British Columbia and Idaho. All material flowered at about the same time in mid-August and all appeared to be equally vigorous. Seed from broad-leaved plants and from narrow-leaved plants from one infestation both produced broad-leaved plants when grown side by side at Saskatoon. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon.)

Brome grass (Bromus inermis) as a competitor with leafy spurge on heavy clay soil. Selleck, G. W. and Coupland, R. T. A research site was established on Regina heavy clay soil in 1951 on an infestation of leafy spurge (Euphorbia esula) in competition with brome grass. The grass had been moderately grazed until 1951, at which time grazing was terminated. In 1951, tremendous numbers of seedlings of leafy spurge germinated, reaching a maximum of 1566 shoots (less than 2 inches in height) per sq. meter. Approximately 450 additional shoots above 2 inches in height probably originated from seed. At least 80% of the seedlings failed to become established. Seedlings were excluded from calculations of density because of their variation in numbers from quadrat to quadrat and from season to season. The total number of shoots of leafy spurge for 6 sq. meters (averaging 321 per sq. meter) decreased 29% the first year, 3% the second. A considerable proportion of this decrease was probably due to a decrease in the number of seedlings over 2 inches in height. A belt transect of 10, 0.25 sq. meter quadrats was counted from the center to the perimeter of the patch. In general, the density of leafy spurge decreased toward the perimeter with a gradation of 988 to 20 shoots per sq. meter in 1953. Quadrats averaging 228 shoots per sq. meter in 1951, increased to an average of 832 by 1953, with an average increase of 67% the first year, 119% the second. Quadrats averaging 81 shoots per sq. meter increased to 202, with an average increase of 87% during 1951-1952, 33% during 1952-1953. Leafy spurge spread an average of 1.24 and 1.51 feet from roots in 1952 and 1953, respectively. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon, with financial assistance from Science Service, Canada Dept. Agric. and the Sask. Agric. Res. Foundation.)

Crested wheat (Agropyron cristatum) as a competitor with persistent perennial weeds. Selleck, G. W. and Coupland, R. T. The competitive ability of crested wheat grass was studied at Mortlach where half of a leafy spurge (Euphorbia esula) infestation had been seeded to this grass in 1949, leaving the other half in competition with annual weeds. From 1951 to 1953, the leafy spurge with crested wheat grass appeared less vigorous, averaging 5 inches shorter in height, and producing an average of 22.6 per cent less seed. The density of the leafy spurge decreased by 22 per cent (on the basis of 10 square-meter quadrats) from 1951 to 1952 compared with a 42.5 per cent increase on the abandoned annual weed stage of succession. Within the next two years, the density of leafy spurge in competition with creasted wheatgrass increased an average of 57 and 10.5 per cent on sparse and dense quadrats respectively, compared with 67 and 19 per cent in competition with annual weeds. On the basis of the increase in total number of shoots during the two years, leafy spurge in the annual weed stage surpassed that in crested wheat grass by an average of 784 and 161 per cent in sparse and dense stands, respectively. During 1952, leafy spurge in competition with crested wheat grass spread by roots an average of 4 inches, compared with a spread of almost 2 feet in the annual weed stage. Trends were similar in 1953. Due, perhaps to extremely moist conditions in 1954, there appeared to be little difference in the spread of leafy spurge in the two habitats. An infestation (consisting of 5 shoots) of Russian knapweed (Centaurea repens) was mapped in competition with crested wheat grass in 1952. Although the location of some of the shoots had changed, no change in the number of shoots occurred either in 1953 or 1954. (Dept. of Plant Ecology, Univ. Saskatchewan, Saskatoon, with financial assistance from Science Service, Canada Dept. Agric.)

Yield losses from weed infestations in corn, as influenced by soil fertility and plant stand. Staniforth, D. W. An area infested with Setaria viridis and S. lutescens was planted with a single cross corn hybrid at rates of 12,000 and 16,000 plants per acre in 40 inch hills. Optimum amounts of P and K fertilizer were applied to the area prior to planting. Nitrogen fertilizer at rates of 0, 70 and 140 pounds per acre elemental nitrogen was applied shortly after corn planting. All plots were cultivated to remove weeds from between the hills. Moderate infestations of Setaria spp. present in the hills of corn were removed at each of five stages of corn development and the plots were kept weed-free for the remainder of the season.

Stages of removal were; at corn emergence, corn with 8-10 leaves emerged, two weeks before tasselling, at tassel emergence, and corn maturity. Yields of weeds removed at maturity ranged from 400 to 1000 pounds dry matter per acre. Significant yield reductions occurred with the following treatment combinations. Plant stands of 12 and 16 thousand per acre, with no nitrogen application showed yield reductions of 5-6 bushels per acre when weeds were left in competition until tasselling or until corn maturity. Plant stand of 16,000 per acre with 70 pounds of nitrogen per acre showed a yield reduction of 5 bushels with weeds left until tasselling and 7.5 bushels when weeds were left until maturity. Plant stands of 12,000 per acre with 70 or 140 pounds of nitrogen, and 16,000 plants per acre with 140 pound of nitrogen showed no significant yield reduction for any of the levels of weed competition. (Iowa Agric. Exp. Station. Ames.)

Effect of naturally occurring weed infestations on yield of soybeans. Staniforth, D. W. and Weber, C. R. Yields of row planted soybeans in which weeds were controlled by conventional cultivation operations and the surviving weed infestations allowed to grow to maturity, were compared with the yields of soybeans which were cultivated and handweeded, and maintained in a weed-free condition throughout the growing season. Weed infestations varied with location and years, but were generally rather uniform as to species and severity within each experiment. Mixtures of Setaria spp. and various broadleaved species generally constituted the weed infestations. Three experiments had an almost pure stand of Setaria and two contained mostly Amaranthus spp. Yields of weeds ranged from 300 to 1200 pounds of dry matter per acre, over the several experiments. Data were obtained from a total of 11 experiments, conducted at several locations over the four year period 1951 to 1954. Yield reductions from weed infestations composed largely of Setaria spp. ranged from 2 - 5 bushels per acre, or roughly 10 to 15 %. Yield reductions from infestations of Amaranthus spp. were generally somewhat greater and approached 25% in one test. When stands of beans were reduced from 10-12 plants per foot of row to 5-6 plants, yield reductions due to weed infestations, were generally 1-2 bushels greater. (Iowa Agric. Exp. Station, Ames, and Field Crops Res. Branch, A.R.S. U.S.D.A.)

Effect of individual species on the growth and yield of soybeans. Staniforth, D. W. and Weber, C. R. Effects on bean yields of amount of infestation in the row, species involved, length of time the weeds remained in competition with the beans, ans stages of growth of soybeans at which the weeds were removed, were investigated over a three year period. Yellow foxtail (Setaria lutescens) and either Polygonum pennsylvanicum, or Abutilon theophrasti were grown as separate infestations and removed at each of six stages of soybean growth from seedling to maturity. Weed infested soybeans were also defoliated to simulate hail injury, and the effects of subsequent weed competition studied. Competititon between weeds in the row and beans began when the beans were 6 to 8 inches tall and persisted throughout the season at approximately the same level. Yield losses in undefoliated beans averaged 10% or less, at the various stages of growth, with infestations of 6 and 12 grass plants or 3 and 6 broadleaved weed species per foot or row. Bean yield depression was more than

twice as great in a favorable year as compared to a very dry season. Foxtail caused greater bean yield losses than broadleaved species. In terms of plant material produced per acre, weeds and soybeans grown together yielded as much as weed-free soybeans. (Iowa Agric. Exp. Station, Ames, and Field Crops Res. Branch, A.R.S., U.S.D.A.)

Toxicity test of artificially dried leaves and stems of toadflax (Linaria vulgaris Hill), 1954. Zilke, S., Bell, J. M. and Coupland, R. T. Toadflax tops, in the vegetative stage, were artificially dried and fed to mice as 5, 10 or 15% of their ration. Both recently dried and one year old stored material were tested. The mice made normal gains in weight and showed no ill effects and no evidence of toxicity. (Depts. of Plant Ecology and Animal Husbandry, Univ. Saskatchewan).

Animal repellents in assenical herbicides. Barrier, George E. Preliminary research indicates that water soluble creosote compounds may be useful as repellents in arsenical herbicides. When alfalfa-brome grass plots were treated with 10 and 100 lbs. of monoethanol amine creosote combined respectively with 40 and 160 lbs/A. of As_2O_3 as ethanolamine arsenite, sheep showed a marked aversion to the treated vegetation. Atlas-D, a sodium arsenite compound with creosote added by the manufacturer, gave comparable results when applied along side the monethanolamine at the same rates. Even when enclosed upon the experiment until the limited areas of untreated vegetation were grazed to the ground, the sheep ate little or none of the treated forage and even avoided untreated vegetation adjacent to it. Cattle showed less aversion to the repellent, but feeding, even of hungry animals, was limited to the barest nibbling, and no suggestions of arsenic toxicity were observed. (Dept. Botany, Iowa Agr. Exp. Station, Ames.)